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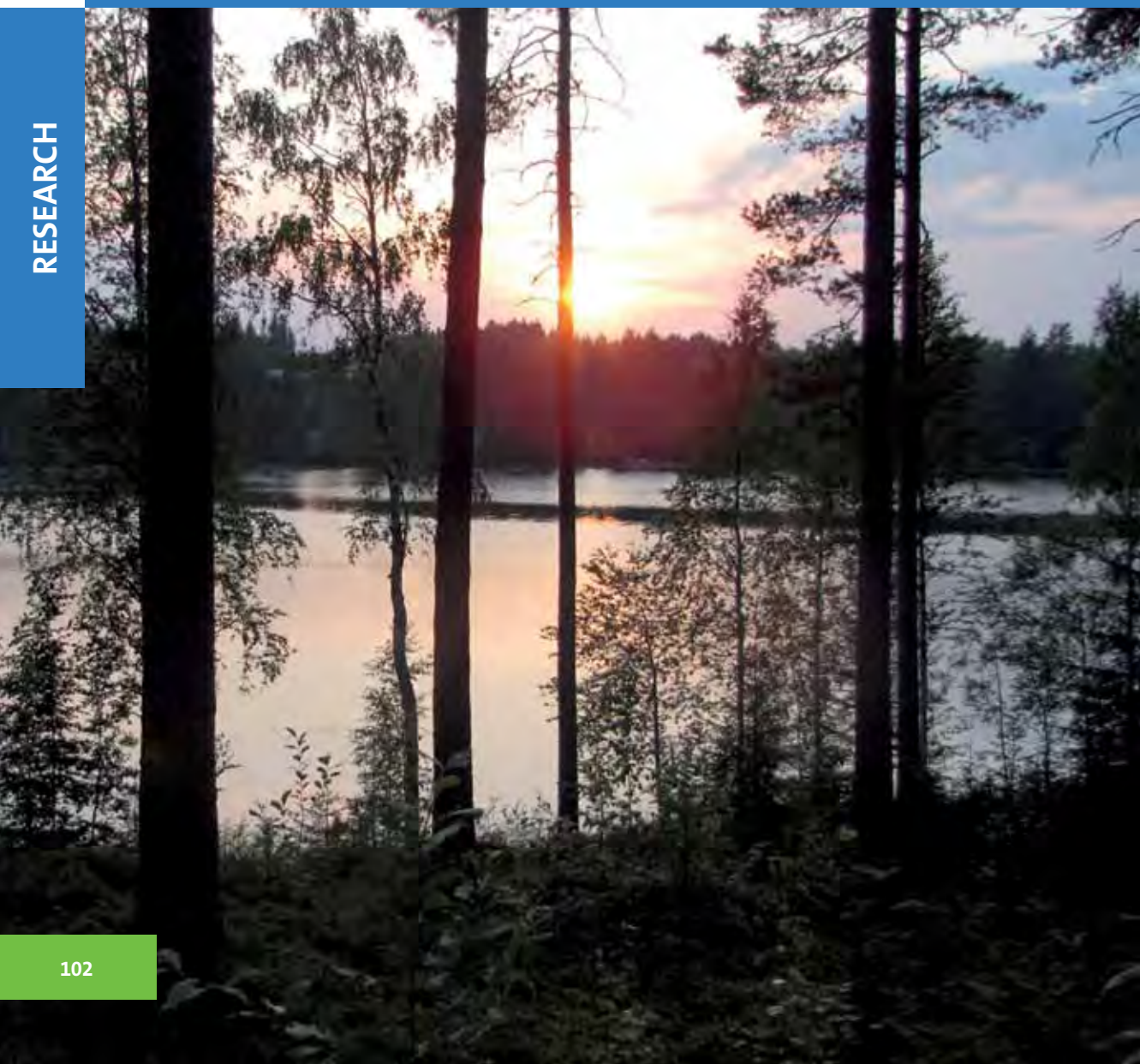
Kirsi Talala

Psychological distress in Finland 1979–2003:

Overall trends, socio-economic differences, and contribution to cause-specific mortality inequalities

RESEARCH



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RESEARCH 102

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ACADEMIC DISSERTATION

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Health and Welfare Inequalities Unit, Department of Health, Functional Capacity and Welfare, National Institute for Health and Welfare,
and
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Abstract

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An estimated 27% of the European adult population is affected by some form of mental disorder. They have shown to be more common among women, unmarried, those with lower educational and income levels, and the unemployed. Persistent or increasing health inequalities are a common phenomenon in the majority of Western countries. However, few studies have explored those differences over time in mental health.

Psychological distress refers to non-specific psychopathology, which includes a variety of symptoms such as depression, anxiety, stress and insomnia. Psychological distress is highly prevalent in the general population, estimates being between 5–48%. It is known to be associated with lower quality of life, mental and physical morbidity and mortality. Moreover, psychological distress has been proposed as one probable explanation in mediating the socio-economic gradient in health and mortality.

Few studies have examined prevalence trends in psychological distress and changes in socio-economic differences in psychological distress over time, or the contribution of psychological distress to the socio-economic differences in cause-specific mortality. Therefore, the objective of this study is to provide new insights into the topic over several decades review period.

The database was the nationally representative and repeated cross-sectional 'Health Behaviour and Health among the Finnish Adult Population' –survey (AVTK, 1979–2002) linked with Statistics Finland register data, and the Finnish Cause of Death Register follow-up, up to 2006. Outcome measures for psychological distress included self-reported depression, insomnia and stress. Socio-economic status was measured by education, employment status and household income. Mortality data consisted of suicide, accidents and violence, alcohol-related causes of death and coronary heart disease mortality. The survey years 2002–2003 were studied separately, including the measures of general mental health (MHI-5) and family status.

The overall prevalence of depression was 14% in men and 18% in women, and that of insomnia was 18–19% among both genders. The prevalence of those reporting stress was 19% in men and 16% in women. Nineteen to twenty per cent reported poor general mental health (MHI-5). Compared to the first study period, 1979–1982, there was an increase in the prevalence of insomnia and stress towards

the later study periods among both genders, whereas the prevalence of depression decreased among women.

Socio-economic differences were demonstrated in all psychological distress measures. However, some of the associations were curvilinear and converse. Educational-level differences in psychological distress varied by the different measures and classifications. Among men, lower levels of educational qualification were associated with higher prevalence of insomnia, whereas the lowest educational level measured in years was associated with less insomnia and less stress among men but poor mental health (MHI-5) among women. Those with higher educational qualifications reported more stress among both genders. However, extremely high stress was more common among lower educated. The unemployed and retired (< 65 years) experienced more depression, insomnia, stress and poor mental health (MHI-5). Those with the lowest household incomes experienced more depression and stress. Moreover, the association between income and stress was non-linear; those in the intermediate levels of income had the least stress.

Respondents who did not have a partner reported more psychological distress according to all measures. Having children under 18 living in the household was associated with more stress among men and with less insomnia among women.

Socio-economic differences in psychological distress, including some curvilinear and converse associations, fluctuated but did not change substantially over the study period 1979–2002. Some narrowing of the differences occurred between the unemployed and employed respondents during a period of high unemployment in 1993–1997, especially in terms of insomnia and stress. Among men, income level differences in stress grew during the latest study periods. Reversed educational-level differences appeared in stress among women after the first study period.

In unnatural mortality, depression, insomnia and extremely high stress accounted for some of the employment status (11–31%) and income level (4–16%) differences among both men and women; and for the differences related to educational level (5–12%) among men. Educational level was not associated with unnatural mortality among women. Dimensions of psychological distress had minor or no contribution to socio-economic differences in CHD mortality.

Further studies are needed to explore the possible increase in insomnia and stress symptoms, as well as the complex socio-economic gradients, especially in stress. As socio-economic differences in psychological distress have remained fairly stable over time; socio-economic factors, but also family status factors, are of the essence when monitoring risk factors for psychological distress. Improvement of psychological distress in certain socio-economic groups may reduce some of the socio-economic differences, particularly in unnatural mortality.

Keywords: psychological distress, depression, insomnia, stress, socio-economic differences, time trends, unnatural mortality, CHD mortality

Tiivistelmä

Kirsi Talala. Psyykkinen oireilu Suomessa 1979–2003: kehitys, sosio-ekonomiset erot ja merkitys kuolleisuuserojen selittäjänä. Terveyden ja hyvinvoinnin laitos (THL). Tutkimus 102/2013. 143 sivua. Helsinki 2013.
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Mielenterveyden ongelmat ovat merkittävä kansanterveydellinen haaste, sillä arviolta 27% Euroopan väestöstä kärsii jonkin asteisista mielenterveyden häiriöistä. Mielenterveysongelmat ovat epidemiologisten tutkimusten mukaan yleisempiä naisilla, naimattomilla, alemmissa tulo- ja koulutusryhmissä sekä työttömillä. Terveyserojen on havaittu olevan pysyväisluonteisia tai kasvavia jo vuosikymmenten ajan useilla terveysmittareilla tarkasteltuna. Tutkimuksia liittyen sosioekonomisten erojen muutokseen mielenterveyden näkökulmasta on tehty kuitenkin niukasti.

Psyykkisellä oireilulla tarkoitetaan yleisluonteista mielenterveyden oireilua, joka sisältää mm. masennus-, ahdistus-, stressi- ja unettomuusoireita. Oireilun tiedetään olevan hyvin yleistä väestössä, ja olevan yhteydessä huonontuneeseen elämänlaatuun, fyysiseen ja psyykkiseen sairastavuuteen sekä kuolleisuuteen. Psyykkisen oireilun on lisäksi otaksuttu olevan eräs terveys- ja kuolleisuuseroja selittävä tekijä.

Tämän tutkimuksen tarkoituksena on selvittää psyykkisen oireilun esiintyvyyden vaihtelua, psyykkisen oireilun sosioekonomisten erojen vaihtelua yli parin vuosikymmenen aikana sekä lisäksi tutkia psyykkisen oireilun osuutta sosioekonomisten kuolleisuuserojen selittäjänä laajalla väestötasolla. Aiheesta ei ole tehty tiettävästi paljoakaan näiltä osin kattavia tutkimuksia.

Tutkimuksessa käytetty aineisto on kansallisesti edustava, toistettu poikkileikkauskysely ’Suomalaisen aikuisväestön terveyskäyttäytyminen ja terveys’ (AVTK) vuosilta 1979–2002, johon on liitetty Tilastokeskuksen sosioekonomisia tietoja koskeva rekisteriaineisto, sekä kuolinsyyrekisteriaineisto vuoteen 2006 asti. Tutkimuksen selitettävät muuttujat olivat psyykkisen oireilun osalta itseraportoitu masentuneisuus, unettomuus ja stressi. Sosioekonomisen aseman mittareita olivat koulutus, työmarkkina-asema ja kotitalouden tulot. Kuolleisuusaineiston vastemuuttujat olivat itsemurhat, tapaturma-, väkivalta-, ja alkoholikuolemat sekä sepelvaltimotautikuolemat. Erikseen tarkasteltiin tutkimusvuodet 2002–2003, jotka sisälsivät yleisen mielenterveyden (MHI-5) sekä perhesuhteita kuvaavat mittarit.

Miehistä 14% ja naisista 18% raportoi masentuneisuutta. Unettomuutta oli 18–19%:lla vastaajista, ja stressiä raportoi 19% miehistä ja 16% naisista. Huono yleinen mielenterveys (MHI-5) oli 19–20% vastaajista. Verrattuna ensimmäiseen tutkimusperiodiin, 1979–1982, stressi ja unettomuus lisääntyivät kohti myöhäisempiä tutkimusjaksoja molemmilla sukupuolilla, sitä vastoin masentuneisuuden osuus väheni naisilla.

Sosioekonomisia eroja havaittiin kaikilla psyykkisen oireilun mittareilla. Koulutuksen yhteys psyykkiseen oireiluun vaihteli eri mittareilla ja luokituksilla. Miehillä alempi koulutustutkinto oli yhteydessä lisääntyneeseen unettomuuteen. Alin koulutus vuosissa mitattuna oli sitä vastoin yhteydessä vähäisempään unettomuuteen ja vähäisempään stressiin miehillä mutta huonoon yleiseen mielenterveyteen (MHI-5) naisilla. Korkeampi koulutustutkinto oli yhteydessä lisääntyneeseen stressiin molemmilla sukupuolilla, kun taas äärimmäisen kova stressi oli yleisempää alemmin koulutetuilla. Työttömillä ja eläkeläisillä (<65 vuotta) oli enemmän masentuneisuutta, unettomuutta, stressiä ja huonompi yleisen mielenterveyden tila (MHI-5). Molemmilla sukupuolilla oli alimmassa tuloryhmässä enemmän masentuneisuutta ja stressiä. Lisäksi stressin ja tulojen yhteys oli käyräviivainen; keskituloisilla oli vähiten stressiä.

Ei-parisuhteessa olevilla psyykkinen oireilu oli yleisempää molemmilla sukupuolilla kaikilla mittareilla tarkasteltuna. Stressiä oli enemmän miehillä ja unettomuutta vähemmän naisilla, jos kotitaloudessa oli alaikäisiä lapsia.

Sosioekonomiset erot psyykkisessä oireilussa eivät pientä vaihtelua lukuun ottamatta muuttuneet merkittävästi tarkastelujaksolla 1979–2002. Huomattavaa on, että osa tarkastelluista sosioekonomisista yhteyksistä oli ei-lineaarisia tai käänteisiä. Erot psyykkisessä oireilussa kaventuivat jonkin verran työssä olevien ja työttömien välillä laman ja korkean työttömyyden ajanjaksolla 1993–1997 erityisesti unettomuuden ja stressin osalta. Miehillä stressiin yhteydessä olevat tuloerot kasvoivat myöhempinä tutkimusjaksoina. Naisilla käänteiset koulutuserot stressin liittyen nousivat esiin ensimmäisen tutkimusperiodin jälkeen.

Ei-luonnollisten kuolemien osalta masentuneisuus, unettomuus ja äärimmäinen stressi selittivät 11–31% työmarkkina-aseman mukaisista ja 4–16% tuloryhmittäisistä kuolleisuuseroista miehillä ja naisilla, sekä 5–12% koulutusryhmittäisistä kuolleisuuseroista miehillä. Naisilla koulutus ei ollut yhteydessä ei-luonnollisiin kuolemansyihin. Psyykkisellä oireilulla oli vähäinen tai ei ollenkaan merkitystä sepelvaltimotautikuolleisuuden sosioekonomisten erojen selittäjänä.

Lisää tutkimustietoa tarvitaan selvittämään havaittua unettomuuden ja stressin kasvua, sekä selvittämään monitahoisia sosioekonomisia yhteyksiä, erityisesti stressiin ja sen eri ilmenemismuotoihin liittyen. Pysyväisluonteiset sosioekonomiset erot psyykkisessä oireilussa osoittavat että sosioekonomisten, sekä lisäksi perhe-asemaan liittyvien, tekijöiden huomioiminen on tärkeää silloin kun halutaan tarkastella psyykkiseen oireiluun yhteydessä olevia tekijöitä. Psyykkisen oireilun väheneminen tietyissä sosioekonomisissa ryhmissä voisi mahdollisesti kaventaa sosioekonomisia terveyseroja, erityisesti ei-luonnollisten kuolemien osalta.

Avainsanat: psyykkinen oireilu, masentuneisuus, unettomuus, stressi, sosioekonomiset erot, ajalliset muutokset, ei-luonnolliset kuolemansyyt, sepelvaltimotautikuolleisuus

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II Kirsi Talala, Taina Huurre, Hillevi Aro, Tuija Martelin, Ritva Prättälä. Trends in socio-economic differences in self-reported depression during the years 1979–2002 in Finland. Soc Psychiatry Psychiatr Epidemiol 2009:44:10:871-879.

III Kirsi Talala, Tuija Martelin, Ari Haukkala, Tommi Härkänen, Ritva Prättälä. Socio-economic differences in self-reported insomnia and stress in Finland from 1979–2002: a population based repeated cross-sectional survey. BMC Public Health 2012:12:650.

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Abbreviations

BDI	Beck Depression Inventory
CHD	Coronary Heart Disease
CI	Confidence Interval
GHQ-12	General Health Questionnaire
GAS	General Adaptation Syndrome
HR	Hazard Ratio
ICD	International Classification of Diseases
ISCED	International Standard Classification of Education
MHI-5	Mental Health Inventory
MI	Myocardial Infarction
OECD	Organisation for Economic Co-operation and Development
OR	Odds Ratio
SES	Socio-economic Status
SF-36	Short Form Health Survey
SPSS	Statistical Package for the Social Sciences
CRP	C-reactive protein
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

1 Introduction

Mental health problems have been recognized as a significant public health issue in the majority of Western countries. They are highly prevalent in the general population, and are known to be associated with lower quality of life and subjective suffering, loss of social function, disability, physical morbidity and mortality (Chevalier et al., 1999, Fryers et al., 2005, Melzer et al., 2003). Therefore, mental ill-health is imposing a significant economic and social burden to societies (Grabe et al., 2009).

In a review of 27 studies in Europe, an estimated 27% of the adult population suffer from at least one mental disorder (Wittchen and Jacobi, 2005). Compared to diagnostic mental disorders, psychological distress is a less specific measure of psychopathology that can be used to describe the overall mental health of the population (Korkeila, 2000). It is generally measured as a combination of several non-specific psychological symptoms, such as depressive symptoms, anxiety, insomnia and perceived stress. In this study, psychological distress mainly refers to self-reported depression, insomnia and stress.

Estimates have shown high rates of psychological distress in studies with varying measures and time periods. In the Health 2000 Health Examination Survey in Finland, the prevalence of psychological distress measured by the General Health Questionnaire (GHQ-12) was close to 24% (Aromaa and Koskinen, 2004). Selective population surveys in the United States, England and Finland have shown prevalence rates of 10–34% for those suffering from depressive symptoms (Lehtinen and Joukamaa, 1994). In an epidemiological review of studies between 1979–2000, the prevalence of insomnia symptoms without restrictive criteria was found to be 30–48% in the general population (Ohayon, 2002). In the Finnish population the overall prevalence of insomnia symptoms was around 38% (Ohayon and Partinen, 2002). The percentage of respondents who experienced ‘a lot’ of stress was 23% among women and 18% among men, according to the 1985 National Health Interview Survey in the US (Silverman et al., 1987).

The few studies that have been conducted on changes in psychological symptoms over time have produced various results. The prevalence of psychological distress measured as depressive symptoms, insomnia or stress, has been found to either remain stable (Wilhelmsen et al., 1997, Aromaa and Koskinen, 2004), fluctuate (Meertens et al., 2003), increase (Kronholm et al., 2008, Rahmqvist and Carstensen, 1998, Jorm and Butterworth, 2006, Rowshan Ravan et al., 2010, Wilhelmsen et al., 1997) or decrease (Bartley et al., 2000) over time. There is a lack of research into the various domains of psychological distress using comparable data and study period.

Research has demonstrated a social gradient in mental disorders (Paykel et al., 2005, Fryers et al., 2003, Pirkola et al., 2005) and psychological distress (McCabe et al., 1996, Gallo and Matthews, 2003). Poor mental health has been more frequently reported in women, those with lower educational attainment, the unemployed or economically inactive groups and those with low income levels (Gellis et al., 2005, Fryers et al., 2003, Fryers et al., 2005, Power and Matthews, 1997, Huurre et al., 2007, Zimmerman and Katon, 2005, Arber et al., 2009, Sekine et al., 2006, Baum et al., 1999). Marital status and parenthood also have been found to be related to mental health (Umberson and Williams, 1999, Barrett and Turner, 2005). Empirical evidence mostly indicates that having a partner is beneficial to mental health, especially for men, and parenthood causes psychological distress, especially for women (Umberson and Williams, 1999). Evidence of socio-economic differences in mental health is not fully consistent, but it does depend on the specific study population, the measures used and cultural context (Aromaa and Koskinen, 2004, Laaksonen et al., 2007, Fryers et al., 2003, Molarius et al., 2009, Lahelma et al., 2006).

Empirical evidence has demonstrated a significant association between psychological distress and general health and health problems (Hamer et al., 2008, Hemingway and Marmot, 1999, Puustinen, 2011), as well as excess mortality associated with psychological distress, especially in deaths from unnatural causes (alcohol-related causes, accidents and violence, and suicide) and cardiovascular diseases (Mallon et al., 2002, Wulsin et al., 1999, Nielsen et al., 2008). In addition, a large body of evidence has linked socio-economic status to general health and mortality (Adler et al., 1994, Kunst et al., 1998, Gallo and Matthews, 2003). A socio-economic gradient is reported in all-cause mortality, as well as in cause-specific mortality such as unnatural mortality and CHD mortality (Kivimäki et al., 2007, Mackenbach et al., 2008, Lorant et al., 2005, Valkonen et al., 2000, Gallo and Matthews, 2003). Socio-economic variation is also significant in Finland in these specific causes of death (Elo et al., 2006, Mäki and Martikainen, 2007, Mäkelä et al., 1997, Martikainen et al., 2001). One plausible explanation for the socio-economic gradient in health and mortality beyond the material and behavioural factors has been proposed to be psychological indicators, such as depression and anxiety (Gallo and Matthews, 1999), stress (Baum et al., 1999, McEwen and Seeman, 1999) and insomnia (Van Cauter and Spiegel, 1999).

Numerous public health policies and programmes, such as WHO's Global Strategy for Health for All by the Year 2000, have sought to reduce socio-economic differences in health, including those in mental health. The health of the population has improved, but socio-economic differences in general health and mortality have remained stable or even widened in Finland (Palosuo et al., 2009, Martikainen et al., 2007, Tarkiainen et al., 2012) and other Western countries (Mackenbach et al., 2003, Kunst et al., 2005, Lahelma et al., 2001). However, few

studies have so far explored possible changes in socio-economic differences in psychological distress over time.

There is a lack of studies that have explored over time trends in the prevalence of psychological distress, or trends in socio-economic differences in psychological distress. Furthermore, few studies have examined whether psychological factors contribute to socio-economic differences in cause-specific mortality. Therefore, the aim of this study is to add to the knowledge of self-reported psychological distress and its association with socio-economic factors by utilizing long-term cross-sectional trend data from 1979 to 2002 with a 28-year mortality follow-up. The data used is from the nationally representative 'Health Behaviour and Health among the Finnish Adult Population' (AVTK) survey, and completed with socio-economic statistics from the Statistics Finland register data and the Finnish Cause of Death Register.

2 Concept of mental health and psychological distress

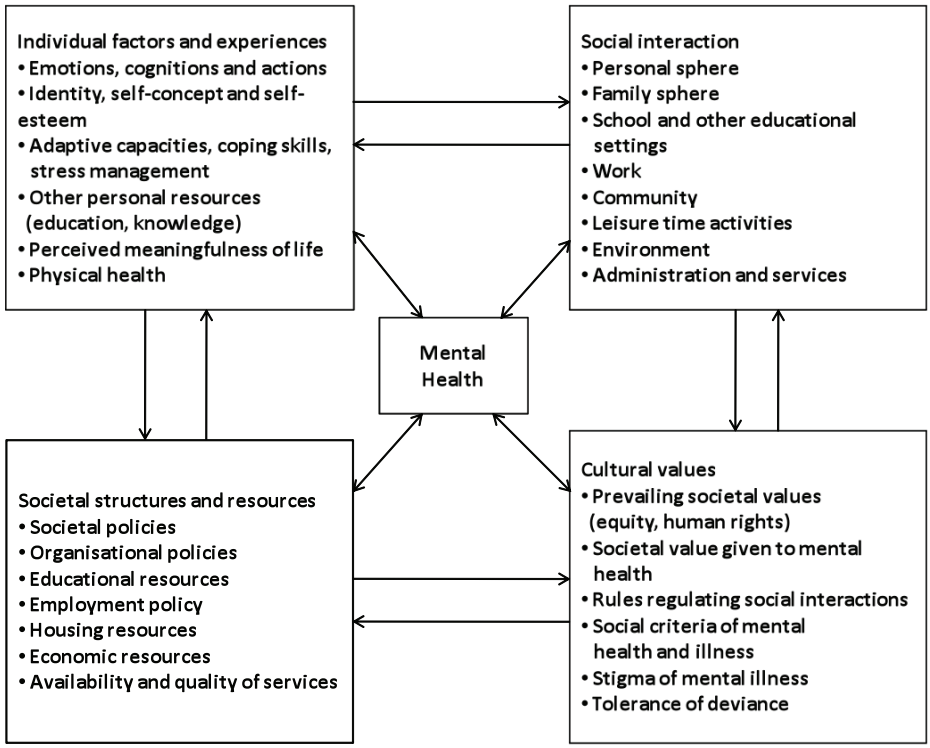
2.1 Mental health

According to the general definition by the World Health Organization (WHO), mental health is ‘a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to his or her community’ (WHO, 2001). Mental health is a wide-ranging concept, which not only refers to severe mental disorders or the absence of mental illness. Mental health is a resource of psychological functioning and managing life, and it comprises such an intrinsic element of general health that health organizations have declared there is no health without mental health (Herrman et al., 2005, Prince et al., 2007). The definition adapted by EU-funded mental health projects states: ‘Mental health, as an indivisible component of general health, reflects the equilibrium between the individual and the environment. It is influenced by individual biological and psychological factors; social interactions; societal structures and resources; and cultural values’ (Lehtinen, 2008).

One common approach is to look at the positive and negative aspects of mental health. The positive aspect of mental health is concerned with mental health resources, such as optimism, self-esteem and self-mastery, as opposed to the negative aspect, which is concerned with mental disorders, symptoms and problems. Another common aspect relates to the relevance of subjective and objective dimensions of mental health. The subjective side of mental health is the experimental knowledge of mental health, whereas the objective side is a concept where mental health is seen to be based on universal empirical facts (Tudor, 1996).

Furthermore, mental health can be viewed based on continuous or discontinuous aspects. Either it is believed that there is a boundary to disorder and normality, or a continuous distribution of symptoms throughout the population, extending from no symptoms or mild psychological symptoms to the most severe mental disorders (Korkeila, 2000, Stein et al., 2005). Mental health and mental illness can be seen as two ends of the same continuum. However, placing mental health on a single continuum may be problematic. This makes it impossible to have, for example, a diagnosed mental disorder and to have a good level of subjective mental health and well-being, or to have a low level of subjective mental health with no diagnosable mental illness. According to the two continua concept originally defined by the Canadian Minister of National Health and Welfare (Minister of National Health and Welfare, 1988) and reconstructed by Tudor (Tudor, 1996).

Figure 1. Determinants of mental health (Lehtinen, 2008).



a distinction is made between the absence of mental disorder and severe mental disorder on one continuum, and minimal to optimal mental health on the other. It is argued that mental disorder is never the only factor determining mental health. It is also argued that ill-health is different from and less fixed than illness. As an implication of the relationship between the two continua concept, individuals could be located on the continua based on having a severe mental illness or no mental illness, and having minimal or optimal subjective mental health.

In the functional model of mental health (Lahtinen et al., 1999), mental health is a central part of a process which is formed by predisposing (e.g. genetic factors, early life factors and social and physical circumstances, education, employment), actual precipitating factors (e.g. life events) and present social context (e.g. social support), as well as by different consequences (e.g. symptoms, level of well-being, physical health).

The determinants of mental health originally presented by Lehtinen (Figure 1) can be either those that enhance positive mental health or those that reduce and are seen as risk factors for mental health. These determinants may also be the causes

or consequences of mental health. Lehtonen and Lönnqvist have grouped different determinants into internal and external threats and protective factors (Lehtonen and Lönnqvist, 2001). External factors, that are considered here more closely, are educational, material and social factors and the employment situation.

2.2 Psychological distress

Psychological distress represents a dimension of mental ill-health that has neither uniform definitions nor measures. Compared to mental disorder, which refers to categorical clinical diagnoses, psychological distress refers to psychopathology that is less specific. Psychological distress is considered a dimension of psychopathology that can be measured in simple and cost-effective ways in the general population. It consists of a combination of depressive symptoms, anxiety and perceived stress as well as general sleeping problems. In a review of mental health indicators for mental health monitoring in Europe, psychological distress is defined as 'a non-specific syndrome that covers constructs such as anxiety, depression, cognitive problems, irritability, anger and obsession-compulsion' (Korkeila, 2000). Psychological distress is often experienced as a part of normal life, a consequence of persistent or temporary adversities, such as distress due to normal life transitions, challenges and losses, in education and work, family life, relationships, ageing and so on, and is associated with social deprivation, exclusion or persecution (Bolton, 2010). One definition combining the causes and psychological and social consequences of psychological distress states following: 'psychological distress is the end result of factors, e.g. psychogenic pain, internal conflicts, and external stress that prevent a person from self-actualization and connecting with "significant others"' (Segen, 2006). Three different dimensions of psychological distress – depression, insomnia and stress – that are included in the present study will be treated in detail in the following chapters.

2.2.1 Depression and depressive symptoms

Depression as a word can be used to describe: (I) an affect which is a subjective feeling tone of short duration; or (II) a mood which is a state sustained over a longer period of time; or (III) an emotion which is comprised of feeling tones along with objective indications; or (IV) a disorder which has characteristic symptom clusters, complexes or configurations (Zung, 1973). In other words, depression can mean a temporary normal reaction towards different life events or crises (depressive affect), or it can be a more constant depressive mood that can last for days, months and even years, and when including other associated symptoms, it is considered a clinical mental disorder (Isometsä, 2001). Furthermore, the Concise Dictionary of Modern Medicine (Segen, 2006) definition defines depression as follows: 'Depression is a spectrum of affective disorders characterized by attenuation of mood, accompanied by psychogenic

pain, diminution of self-esteem, retardation of thought processes, psychomotoric sluggishness, disturbance of sleep and appetite, and not uncommonly, suicidal ideation'. Depression measurements are divided into two major groups which are self-rating methods and clinician-rating scales. Self-ratings emphasize the experience of depression with subjective and affective elements (McDowell, 2006).

Depressive symptoms are grouped into affective (such as sadness, apathy), cognitive (such as thoughts of hopelessness, guilt, suicide) and somatic components (such as energy level, appetite, sleep) (McDowell, 2006). As depression is defined by a cluster of symptoms, depressive symptoms exhibit different variations in different people. Depressive symptoms have shown to have high prognostic significance as they seem to predict the future risk of major depression (Horwath et al., 1994, Judd and Akiskal, 2000, Cuijpers and Smit, 2004).

2.2.2 Insomnia

In general, definitions of insomnia are related to considerations of primary/secondary insomnia, difficulty initiating or maintaining sleep, non-restorative sleep, persistence, duration and chronicity, and complaints accompanied by impairment to daytime function (Drake et al., 2003). According to the dictionary definition, insomnia is 'the perceived or actual inability to sleep one's usual amount of time; a condition characterized by any combination of difficulty with falling asleep, staying asleep, intermittent wakefulness, and early morning awakenings; episodes may be transient, short-term lasting 2-3 weeks, or chronic' (Segen, 2006).

In his review, Ohayon presented numerous factors that can initiate or maintain insomnia symptoms (Ohayon, 2002). Self-induced factors include lifestyle-related factors such as shift work, irregular sleep-wake schedule, poor sleep hygiene, stress and environmental factors. Self-induced factors are also related to psycho-active substances (e.g. alcohol, caffeine, anxiolytics, illicit drugs). Secondary factors associated with insomnia are related to mental disorders (e.g. depressive disorders), medical conditions (e.g. headache, menopause, arthritis, infection, heart disease), breathing disorders during sleep (e.g. sleep apnoea), and other sleep disorders (e.g. restless legs syndrome). Primary insomnia has no other identifiable factors that are responsible for the complaint.

2.2.3 Stress

Stress has been described, among other things, as 'a bodily or mental tension resulting from factors that tend to alter an existent equilibrium' (Lovallo, 1997), or 'a force that causes a change in physical or mental health' (Segen, 2006). In other words, as a general concept stress can be defined as a psychological and

physiological response to a situation that threatens or challenges us and requires us to make some kind of adjustment.

Moreover, stress is a complex construct that can be viewed from several different dimensions which embody stressor domain, stress duration, severity, exposure (e.g. objective events), experiences (e.g. perceptions of stress), responses and outcomes (i.e. subjective distress) (Matthews and Gallo, 2011). In other words, stress may be work-related, related to traumatic events, different life events (e.g. divorce, death of a relative, job loss), daily hassles, and it appears with different severity and duration. People perceive and are therefore affected by stress in different ways; in some cases it may be considered to result in positive outcomes, while in other cases it can lead to negative outcomes (Silverman et al., 1987, McEwen and Stellar, 1993). Stress is also characterized as a state that occurs when people perceive that demands exceed their abilities to cope (usually measured by self-reports of subjective experience) (Almeida et al., 2005).

A classic model for stress was presented by Selye in 1956 (Selye, 1976) called the General Adaptation Syndrome (GAS). The GAS presents a human's adaptive response to stress which consists of three stages; alarm reaction, stage of resistance and stage of exhaustion. Upon encountering a stressor, the alarm reaction activates the 'fight or flight' response to an emergency with the release of stress hormones. If the reaction continues, the physiological reaction enters the stage of resistance, when the body tries to adapt to the stressor. At this stage the body becomes vulnerable to health problems, for example, and may not be able to resist new stresses. The final stage, exhaustion, is caused by severe long-term or repeated stress. At this stage, the immune system and the body's energy reserves are weakened until resistance is very limited. If the stress continues, the organism exhausts resources and becomes vulnerable to disease and death.

In the transactional model of stress and coping (Lazarus and Folkman, 1984), psychological stress is viewed as a relationship between individuals and their environment. This definition points to two processes as central mediators within the person–environment transaction: (1) cognitive appraisals and (2) coping. Cognitive appraisal relates to the cognitive evaluation of the situation as potentially stressful. Primary appraisal is an assessment of the significance of a stressor or threatening event as being a threat, a challenge or a loss. Secondary appraisal is the evaluation of the controllability of the stressor and a person's coping resources (physical, social, psychological or material). In this theory, coping is defined as 'cognitive and behavioural efforts to master, reduce or tolerate the internal and/or external demands that are created by the stressful transaction'. Outcomes of coping are factors such as emotional well-being, functional status and health behaviours.

3 Psychological distress from a public health perspective

Measuring self-reported psychological symptoms has a major impact on what we know about general mental health in the population. Psychological distress is known to be prevalent, associated with lower quality of life, disability and functional impairment; and consequently associated with significant costs to individuals and society. Major concerns from a public health perspective also include the main indicators of distress used in this study: depression, insomnia and stress.

Depression represents a major public health problem worldwide. It causes mental suffering and disability, and physical morbidity (Paykel et al., 2005) and mortality also in subclinical forms of depression and self-reported depression (Wulsin et al., 1999, Cuijpers and Smit, 2002). Depression was the fourth leading cause of disease burden in the world in 1990 and 2000. Estimates for the year 2000 found that depression accounted for 4.4% of total disability adjusted life years (DALYs, based on estimates of mortality, prevalence, incidence, average age at onset, duration and disability severity), and it caused the largest amount of non-fatal burden, accounting for almost 12% of all total years lived with disability worldwide (Ustun et al., 2004). In Finland, depression has become the most common reason for granting disability pension (Statistics Finland, 2010, Salminen et al., 1997). Depressive symptoms and psychological distress have been found to be associated with the use of general and mental health services, and with clinically assessed mental health status (Hoeymans et al., 2004, Parslow and Jorm, 2000, Viinamäki et al., 1994), as well as with predicting the elevated risk for developing a psychiatric disorder (Horwath et al., 1994, Cuijpers and Smit, 2004, Judd and Akiskal, 2000). Health problems and health behaviour that have been found to be related to depressive symptoms and psychological distress include coronary heart disease, smoking, physical inactivity, alcohol use, hypertension, elevated C-reactive protein (CRP), metabolic syndrome, cholesterol (van Gool et al., 2003, Lampinen et al., 2000, Haukkala et al., 2000, Hamer et al., 2008, Molarius et al., 2009, Puustinen, 2011, Hemingway and Marmot, 1999, Viinamäki et al., 2009, Albus, 2010, Igna et al., 2008), unhealthy food choices (Konttinen et al., 2010) and weight changes (Haukkala et al., 2001).

Insomnia is known to have a major negative impact at both the individual and societal level, including daytime functional impairment, loss of productivity, absenteeism from work and work accidents (Metlaine et al., 2005). Insomnia has also been found to be associated with mental disorders and organic diseases, a higher level of health care consumption and lower quality of life (Ohayon, 2002,

Chevalier et al., 1999), as well as subsequent disability retirement (Lallukka et al., 2011). Insomnia is known to be associated with several medical conditions, such as arthritis, pain and respiratory symptoms (Ohayon, 2002), and is assumed to facilitate the development of obesity, diabetes and hypertension (Van Cauter and Spiegel, 1999, Pyykkönen et al., 2012), as well as coronary heart disease (CHD)(Schwartz et al., 1999).

Evidence of stress on public health has shown that acute or chronic stress contributes as a risk factor to disease and medical conditions, such as asthma, diabetes, abdominal obesity, metabolic syndrome, gastrointestinal disorders, coronary heart disease, hypertension, heart attacks, cancer, infections and autoimmune diseases (McEwen and Stellar, 1993, Adler et al., 1994, McEwen, 1998, Pyykkönen et al., 2010). Health behavioural problems including smoking, alcohol and drug consumption, and poor eating habits have been also found to be related to stress (Stroebe, 2000).

Physical and health behaviour problems which are associated with psychological distress are those that also correlate with lower socio-economic status.

3.1 Prevalence of psychological distress

The estimates for the psychological distress vary across different outcomes and studies. In a Swedish population study, the 12-month prevalence for frequent symptoms of psychological distress was 5–10% (Rahmqvist and Carstensen, 1998). In random sample telephone interviews of the Finnish general population (conducted between 1993–1995), the prevalence for psychological distress measured by the GHQ-12 was between 15.6% and 24.5% (Viinamäki et al., 2000). In the Finnish population study from 2000, the prevalence estimate for psychological distress measured by the GHQ-12 was close to 24% (Aromaa and Koskinen, 2004).

According to the European Outcome of Depression International Network (ODIN) study, the overall prevalence of depressive disorders in randomly selected samples of the general population in five European countries (UK, Ireland, Norway, Finland and Spain) was around 9%. The prevalence of depression appears to vary considerably across countries (Ayuso-Mateos et al., 2001). Depressive symptoms are much more common than depressive disorders. Selective population surveys in the United States, England and Finland have shown prevalence rates of between 10–34% for those suffering from depressive symptoms (Lehtinen and Joukamaa, 1994). A Finnish estimate for the prevalence of depressive mood has been 17% (Isometsä et al., 1997), and the estimate for self-reported depression (BDI scores of more than 9, indicating at least mild depression) has been 13.5% among men and 20.2% among women (Varjonen et al., 1997).

The overall prevalence of insomnia symptoms was nearly 38% in the Finnish population in 2000 (Ohayon and Partinen, 2002), and other estimates from European population studies have shown prevalence rates of 4–22% for severe insomnia (Chevalier et al., 1999). In an international review the prevalence of insomnia symptoms without restrictive criteria (based on 'yes-no' answers) was estimated to be between 30–48% in the general populations (Ohayon, 2002).

Most of the studies regarding stress have focused on the working population and on work-related chronic stress, i.e. burnout (Ahola et al., 2006, Maslach et al., 2001). Fewer studies have examined the prevalence of self-reported stress in the general population. One estimate is provided by the 1985 National Health Interview Survey in the US: the percentage of respondents who experienced 'a lot' of stress was 23% among women and 18% among men (Silverman et al., 1987).

3.2 Time trends in prevalence of psychological distress

Reports on the trends in the prevalence of psychological distress and depressive symptoms varies substantially; depending on the study they have either fluctuated (Meertens et al., 2003) increased (Rahmqvist and Carstensen, 1998, Jorm and Butterworth, 2006) or decreased (Bartley et al., 2000) since the 1980s. Insomnia-related symptoms have been found to increase in the period 1995–2005 in a comparative review and re-analysis of various survey data in Finland (Kronholm et al., 2008). Furthermore, in a Swedish population study of women, the prevalence of sleeping problems increased (Rowshan Ravan et al., 2010) over the 36 years of observation. In three population samples in Sweden in 1985, 1990 and 1995, the proportion of those reporting psychological stress increased between 1985 to 1995 amongst women aged 25–34, whereas little variation was observed in men (Wilhelmsen et al., 1997). In Finland, no directly comparable data is available to evaluate whether the prevalence of psychological distress has changed over time. However, according to Health 2000's Health Examination Survey, depression, anxiety and psychological symptoms were about as prevalent as they were during the 1980s (Aromaa and Koskinen, 2004). No study has been conducted on the prevalence of self-reported stress over time in Finland.

3.3 Socio-economic and social determinants of mental health and psychological distress

The social context of mental health is concerned with the effects of the social environment on the individual and with the effects of the person on his/her social environment (Lewis, 2011). Measures of socio-economic position indicate particular structural locations within society. Depending on the theoretical and historical background, socio-economic status is one of the constructs used to describe socio-economic position (Galobardes et al., 2006).

There are important political, cultural and institutional factors that affect how socio-economic conditions influence health. According to Lynch and Kaplan (Lynch and Kaplan, 2000) "socioeconomic position is used to mean the social and economic factors that influence what position(s) individuals and groups hold within the structure of society, i.e. what social and economic factors are the best indicators of location in the social structure that may have influence on health". Socio-economic disparities in health have been recognized and researched over several decades, and there are a number of reviews of this research. It has been concluded, that SES relates to specific health outcomes (such as cardiovascular diseases, renal disease, diabetes, cancer and arthritis) as well as majority of mortality causes (Williams, 1990, Adler et al., 1994, Lynch et al., 2000, Marmot et al., 1987).

Education, income, wealth and occupational classifications are all indicators of the resources and prestige that individuals hold, and what sort of 'life chances' they have (Lynch and Kaplan, 2000). Resource-based measures of socio-economic status assess access to material and social resources and goods (i.e. the economic component of SES), whereas prestige-based measures refer to an individual's status in a social hierarchy (i.e. the 'social' component of SES) (Matthews and Gallo, 2011).

Socio-economic status as indicated by education, income and occupation or a combination of these has been commonly and inversely related to the prevalence of common mental disorders, psychological distress, and depressive and anxiety symptoms (Fryers et al., 2003, Gallo and Matthews, 2003). Socio-economic and social factors that have been shown to correlate with psychological distress include being unmarried (single, widowed or divorced), living alone, unemployment, lower educational and income levels, and lower occupational position. Factors pertaining to parenthood are also related to mental health; empirical evidence mostly indicates that parenthood causes psychological distress, especially for women (Umberson and Williams, 1999). A review presented by Gallo and Matthews (Gallo and Matthews, 2003) showed that around two-thirds of the examined studies suggested an inverse relationship between SES and depressive symptoms, whereas one-third showed an inverse association for some groups or measures and non-significant associations for others. Some recent studies have failed to demonstrate the association between psychological symptoms and certain socio-economic indicators (Aromaa and Koskinen, 2004, Lahelma et al., 2005, Laaksonen et al., 2007, Meertens et al., 2003, Matthews et al., 2008, Molarius et al., 2009). Moreover, the associations of socio-economic factors and family status with psychological distress may be different for men and women (Hoeymans et al., 2004, Matthews et al., 2001, Denton et al., 2004, Umberson and Williams, 1999).

One way to illustrate the general pattern of environment, including the socio-economic and social environment, associated with mental health is the nine-category model by Warr (Warr, 1987). This model has presented a number of environmental features responsible for mental health: opportunity for control, skill use, interpersonal contact, external goal and task demands, variety, environmental clarity, availability of money, physical security, and valued social position. Environmental features associated with mental health are seen as analogous with vitamin intake. An increase in vitamins may be beneficial up to a certain point, from where the increase in vitamins yields no further benefit, or it may even be toxic to exceed certain levels of vitamin intake.

3.3.1 Education

Education has a socially symbolic and material value. Exposure to formal education involves knowledge and cognitive skills that have broad potential to influence health. Education is a fundamental component of socio-economic status, as educational success also provides information about the likelihood of future success, and is a strong determinant of future employment and income. For those with less education, the working environment may require working in hazardous environments with exposure to chemicals, radiation, biological hazards, physical stress, noise, heat, unsafe conditions, cold, dust, and other pollutants (Lynch and Kaplan, 2000, Galobardes et al., 2006). Education is also a useful measure in individuals that are economically inactive and not in the labour force (Matthews and Gallo, 2011).

The effect of education on psychological distress has proved to be inconsistent, as several previous studies have found an educational gradient, for example, in depressive symptoms (Belek, 2000, Fryers et al., 2003, Fryers et al., 2005, Lorant et al., 2003), insomnia (Gellis et al., 2005) and chronic stress syndrome (Ahola et al., 2006), but several studies have also found reversed or have failed to show any significant gradient (Aromaa and Koskinen, 2004, Meertens et al., 2003, Chen et al., 2005, Molarius et al., 2009, Lahelma et al., 2006).

3.3.2 Employment status

Work is the major structural link between education and income, and a major dominant factor of adult life (Lynch and Kaplan, 2000).

Unemployment has been widely reported to increase mental health problems and psychological distress (Warr, 1987, Warr et al., 1988, Fryers et al., 2003, Lahelma, 1989, Viinamäki et al., 1993, Murphy and Athanasou, 1999). Bartley (Bartley, 1994) has presented four mechanisms that may produce the relationship between unemployment and ill-health. Those mechanisms are the role of relative poverty; social relations and self-esteem; health behaviour; and subsequent employment patterns that may follow. Ill-health itself may lead to low status on

job markets, and job loss may cause ill-health or these processes may be combined (Bartley, 1994). For example, stress has been found to predict unemployment, which in turn predicts stress (Leino-Arjas et al., 1999).

Economically inactive groups have also demonstrated associations with psychological distress (Wiggins et al., 2004). There is evidence of both a decrease and an increase in insomnia following retirement (Ito et al., 2000, Marquié and Foret, 1999, Vahtera et al., 2009). However, early retirement has been found to be associated with decreased mental health (Buxton et al., 2005, Mein et al., 2000, Olesen et al., 2012, Molarius et al., 2009).

In the demand-control model by Karasek (Karasek and Theorell, 1990), psychological demands, decision latitude and social support at work form the three major dimensions that are relevant to understanding how the psychosocial work environment affects health. Siegrist (Siegrist, 1996) presented the effort-reward model in order to assess the adverse health effects of high-effort/low-reward conditions that are prevalent in occupational life. This model looks into reciprocity of exchange in work life, including consideration of income and other rewards derived from work, personal coping and pressure, and status control.

3.3.3 Income

Income is a useful measure of socio-economic position because it relates directly to the wide range of material resources that may influence health (Galobardes et al., 2006). Material circumstances that have direct implications for health include housing, food, clothing, transportation, medical care, child care, opportunities for leisure activities and a cleaner environment. Adequate income is a generalized resource that provides access to a larger variety and better quality of health enhancing goods and services. A graded relationship between income and health is no longer solely limited to material deprivation but also reflects social ordering (Schnittker, 2004a). Psychological distress and mental health problems have been found to be generally more common among the lower income groups (Fryers et al., 2003, Fryers et al., 2005).

Income is shared in households, which are defined as: ‘individuals or groups of individuals who live together and use jointly part or all of their income and wealth, and who consume certain types of goods and services collectively, mainly housing and food’ (Lynch and Kaplan, 2000). It is suggested that household income estimates provide more complete information regarding the standard of living and access to material goods that people have (Matthews and Gallo, 2011).

3.3.4 Family status

Social determinants of psychological distress include factors related to family status such as partnership and parenthood. Empirical evidence mainly indicates that partnership is beneficial to mental health. Across studies, those who are

married exhibit lower rates of psychological distress compared to the widowed, the divorced and the never-married (Aro et al., 2001, Aromaa and Koskinen, 2004, Aluoja et al., 2004, Joutsenniemi et al., 2006). Umberson and Williams (Umberson and Williams, 1999) have presented theoretical explanations for the positive effects of partnership on health. These include higher levels of social support and social integration, an enhanced sense of meaning and lower levels of financial strain. Alternative explanations focus on the stress model of partnership dissolution or processes of health selection as the mechanisms responsible for marital status differences in mental health.

Parenthood also affects mental health. The transition to parenthood impacts on marital quality and increased financial strain. Research evidence is varying; having children generates an increased or decreased risk of psychological distress among women and a decreased risk or no association among men (Matthews et al., 2001, McDonough and Walters, 2001). Parents with children under 18 exhibit more psychological distress than people who have no children and parents of adult children, especially in women (Umberson and Williams, 1999).

3.4 Time trends in socio-economic differences in psychological distress

Few studies have explored trends in socio-economic differences in psychological distress, and the scarce findings are contradictory.

In Sweden (Rahmqvist and Carstensen, 1998), analyses of trends in psychological distress (depression, anxiety, anguish, sleeplessness) in repeated cross-sectional surveys over the economic recession period from 1989 to 1995 showed a significant increase in psychological distress in both employed and unemployed respondents. A cross-sectional survey found a narrowing of inequality in psychological distress as indicated by the GHQ in men in England between 1984 and 1993 (Bartley et al., 2000).

A longitudinal study of depressive symptoms (loneliness, pointlessness, dejection and discomfort) conducted in the Netherlands between 1975–1996 revealed that over time, people with low incomes have become more likely to suffer from depressive symptoms compared to those with high incomes (Meertens et al., 2003). In a longitudinal cohort study in 1981–2000, social class inequalities in psychological distress measured by the Malaise Inventory seemed to reduce in magnitude over time (Sacker and Wiggins, 2002). Another longitudinal UK cohort study found increasing employment grade inequality in psychological distress and depression (GHQ) since the 1985–88 baseline over the 11 years of follow up (Ferrie et al., 2002).

3.5 Explanations for socio-economic differences in psychological distress

Explanations for socio-economic differences in psychological distress, as in general health, can be observed from two theoretical viewpoints, namely health selection and social causation. According to health selection theory, people with pre-existing illness drift down the social scale and those with better health tend to move upwards. The argument is that health may determine social position rather than the reverse. Models of causation of morbidity and mortality emphasize social factors and the physical environment. Social causation sees the health differences through the experience of adversity and stressors in low social status, and higher social groups experiencing more favourable conditions. These favourable conditions include material advantage in childhood or adulthood, good social relationships, a favourable home environment and labour force participation (Mackenbach et al., 2002). In the causation theory, certain risk factors for ill-health accumulate in the lower social classes. These risk factors may be grouped into aspects related to health behaviour (e.g. smoking, nutrition), psychosocial stress (e.g. life events, social support), and environmental or structural causes (e.g. occupational exposures, material deprivation) (Mackenbach et al., 1994).

Power and colleagues (Power et al., 2002) found in a study of childhood and adulthood risk factors for socio-economic differentials in psychological distress that social gradients were primarily due to social causation in which both childhood and adult life factors appeared to contribute to the development of inequalities. A review of the evidence suggests that social causation plays a larger part than social selection in the development of the socio-economic gradient in depressive symptoms (Gallo and Matthews, 2003, Stansfeld et al., 1998). One study has found employment status and financial strain, but not income, to relate causally to depressive symptoms (Zimmerman and Katon, 2005). On the other hand, there are results emphasizing low socio-economic status as both a cause and a consequence of psychosomatic symptoms (e.g. abdominal pain, loss of appetite, headache, lack of energy or depression, sleeping difficulties, nausea or vomiting, anxiety or nervousness) for females and more health selection among males (Huurre et al., 2005).

According to Wilkinson, the psychological pain resulting from low social status affects patterns of violence, disrespect, shame, poor social relations and depression (Wilkinson, 1999). In the model presented by Gallo & Matthews (Gallo and Matthews, 2003), individuals with low SES may be more vulnerable to psychological distress, either as a function of increased stress exposure in the low SES environment, or as a direct correlate of disadvantage. In other words, low SES is related to more frequent exposure to harmful of threatening situations and fewer rewarding or beneficial situations, which in turn are believed to have a negative impact on emotional experiences. Additionally, it is claimed that lower

SES individuals have a smaller bank of resources, including fewer stress-dampening resources, which are further reduced by stress exposures. Schnittker (Schnittker, 2004b) has proposed that the resources provided by socio-economic status are related to the inferences individuals draw about the self, which might affect physical and mental health.

3.6 Psychological distress related to mortality

Empirical evidence has demonstrated excess mortality rates associated with mental disorders (Joukamaa et al., 2001) and psychological distress (Gallo and Matthews, 2003). In addition to all-cause mortality, psychological distress has been linked to an excess of deaths from ischemic heart disease and respiratory diseases among both sexes, and cancer mortality among women (Ferraro and Nuriddin, 2006, Huppert and Whittington, 1995, Robinson et al., 2004, Puustinen et al., 2011). Depression has been found to particularly increase the risk of death by unnatural causes (e.g. injuries and suicide), and cardiovascular mortality especially among men, but not the risk of death by cancer (Wulsin et al., 1999, Joukamaa et al., 2001). It has been shown that the increased risk of mortality not only exists in major depression, but also in subclinical forms of depression (Cuijpers and Smit, 2002). In the Finnish FINRISK study depressive symptoms predicted all-cause mortality among both genders, however, depressive symptoms were found to be associated with CHD-related events (fatal and non-fatal) only among women (Haukkala et al., 2009). Depressive symptoms in cardiac patients have been found to be related to increased mortality (Frasure-Smith et al., 1999, Bush et al., 2001).

Insomnia has shown to be associated with coronary artery disease mortality among males but not among females (Mallon et al., 2002). There is also some evidence of self-reported difficulty in sleeping not being related to all-cause mortality (Huppert and Whittington, 1995).

In the Danish study, self-reported stress has been found to be associated with all-cause mortality, and moreover, most pronounced with external causes of death, suicide and for deaths due to respiratory causes among males. In addition, high stress was found to be related to a higher risk of ischemic heart disease mortality among younger, but not older, men. No associations were found between stress and mortality among females, except among younger women with high stress who had lower cancer mortality (Nielsen et al., 2008). Another study with the same data showed an association with self-reported stress and fatal stroke among both sexes (Truelsen et al., 2003).

3.7 Psychological distress explaining socio-economic differences in health and mortality

Socio-economic inequality in general health is well reported in numerous studies. Lower socio-economic groups have shown a higher prevalence of poor self-rated health, medical conditions and disabilities, as well as all-cause and cause-specific mortality (Mackenbach et al., 1997, Palosuo et al., 2009, Williams, 1990, Mackenbach et al., 2002, Mackenbach et al., 2008). The explanations for socio-economic inequalities in health include adverse material circumstances, unhealthy behaviour and adverse childhood circumstances. In addition to these factors, psychological indicators, such as negative emotions (including depression and anxiety) (Gallo and Matthews, 1999), stress (Baum et al., 1999, McEwen and Seeman, 1999) and insomnia (Van Cauter and Spiegel, 1999) have been proposed as one plausible explanation for the socio-economic gradient in health.

In the model by Marmot and Brunner (Marmot and Brunner, 2001), social structure is linked to health and disease via material, psychosocial and behavioural pathways. In this approach, psychological distress is not seen as the property of an individual but as the response of the individual to the external environment acting upon him or her. They have also suggested that socio-economic differences in health are at least partly mediated by psychological distress stemming from socio-economic deprivation, which includes not only absolute deprivation but also relative deprivation, that is, one's position in the hierarchy. In Williams' (Williams, 1990) conceptual framework, psychosocial factors consisting of health behaviours, social ties, perception of control, stress and affective states, are seen as critical mediators between social structure and health status. In the reserve capacity model presented by Gallo and Matthews (Gallo and Matthews, 2003), dynamic associations among environments of low socio-economic status, stressful experiences, psychosocial resources, emotion and cognition, and biological and behavioural pathways predict disease and mortality over time.

There is varying evidence regarding the potential mediating role of psychological factors on the relationship between socio-economic position and health concerning different health measures and psychological outcomes (Gallo and Matthews, 2003). Cohen, Kaplan and Salonen (Cohen et al., 1999) have found that psychosocial variables (e.g. stress, personal control, social support, anger and hostility, depression and hopelessness) only partly mediate the association between income and education and poor self-rated health. Schnittker (Schnittker, 2004b) has also found only weak effects with self-esteem, mastery, neuroticism and depressive symptoms mediating the relationship between socio-economic position and self-rated health, functional limitations and chronic conditions. The results provided the strongest evidence for mediation in cases of neuroticism and depressive symptoms. In a Hungarian population study, depressive symptom severity mediated between relative socio-economic deprivation and higher self-

rated morbidity rates, especially among men (Kopp et al., 2007). There is less evidence that supports the role of stress as a pathway connecting SES and health (Matthews and Gallo, 2011).

In relation to mortality, there is some evidence that psychological factors play a mediating role in mortality inequality. Khang and Kim (Khang and Kim, 2005) found depression and perceived stress to explain 11% of the differences in the all-cause excess mortality for low versus high income. Lantz and colleagues showed that controlling measures of chronic stress (financial, marital, parental, and occupational) and life events attenuated the socio-economic differences in all-cause mortality for those on lower income levels relative to the highest income level. In this study income, but not education, was predictive of mortality (Lantz et al., 2005). Psychological factors (depression, hopelessness, cynical hostility) were found to contribute to the association between income level and cardiovascular mortality, but less for all-cause mortality (Lynch et al., 1996). In another study, psychological distress, as measured by hopelessness, depression and life dissatisfaction, contributed to 3–11% to socio-economic disparities in all-cause mortality (Fiscella and Franks, 1997). Van Oort and colleagues (van Oort et al., 2005) have examined the contributions of material, behavioural, and psychosocial factors (e.g. life events, long lasting difficulties, emotional social support, active and avoiding coping styles, and locus of control) to the explanation of educational inequalities in all-cause mortality. They have found that of these three groups of factors, material factors contributed most to the educational inequalities partly via psychosocial and behavioural factors. Psychosocial factors contributed to educational inequalities partly via behavioural factors. They have concluded that when independent of material factors, psychosocial factors contribute little to the explanation of educational inequalities in all-cause mortality.

3.8 Summary of previous research

Previous research has shown that psychological distress, including various symptoms of depression, insomnia and stress is relatively common among the general population; prevalence estimates vary between 5–48%, depending on the measure. Previous studies of prevalence trends in psychological distress over time have explored discontinuous time periods with varying findings. Psychological distress and depressive symptoms have either found to fluctuate, increase and decrease, and insomnia symptoms to increase over time. There is a lack of studies that have explored prevalence of stress over time. Therefore, the present study aims to obtain and compare information about the prevalence of several dimensions of psychological distress covering a comprehensive 24–year period.

Socio-economic differences in mental health are well reported. Many of the studies have found higher levels of psychological distress among those with lower educational level, the unemployed and those with lower incomes. However, not

many studies have examined changes in socio-economic differences in psychological distress over time. Few studies that have explored over time trends have shown contradictory findings indicating stability, and both an increase and a decrease in socio-economic inequality in depressive symptoms and psychological distress. Moreover, there is a lack of studies that have explored changes in socio-economic differences in insomnia and stress over time.

Socio-economic differences in health are not completely explained by health behaviour or material factors, therefore it has been proposed that psychological distress may be one possible mediator. Previous studies that have examined the possible contribution of psychological distress on socio-economic differences in health have used various psychological indicators and health outcomes, and the results here are also varying. Few studies have included insomnia, and furthermore, the role of stress in connecting SES and health is disputable. There is some evidence that psychological factors may play a mediating role in mortality inequality, however, few studies have examined cause-specific mortality.

4 Aims and the framework of the study

Few surveys have explored long-term prevalence and changes in socio-economic differences in psychological distress in the general population, and the prevailing evidence has been inconsistent. The evidence regarding the potential mediating role of psychological distress on the relationship between SES and health is not explicit and there is a lack of studies relating to cause-specific mortality.

Therefore, the overall aim of the present study is to look into 24-year trends in the prevalence and socio-economic differences in psychological distress, and to explore the role of psychological distress in generating socio-economic differences in mortality at an extensive population level. The main focus of the study is to explore trends by socio-economic factors; hence trends by family status factors are not examined. The framework of the study is presented in Figure 2.

Objectives

In more detail, the objectives are to assess:

1) Trends in the prevalence in self-reported depression, insomnia and stress over a 24-year period (Substudies II-III),

2) Socio-economic status (Substudies I-III) and family status (Substudy I) associated with different domains of psychological distress,

3) Trends in socio-economic differences in self-reported depression, insomnia and stress over a 24-year period (Substudies II-III),

4) The contribution of psychological distress on socio-economic differences in cause-specific mortality (Substudy IV).

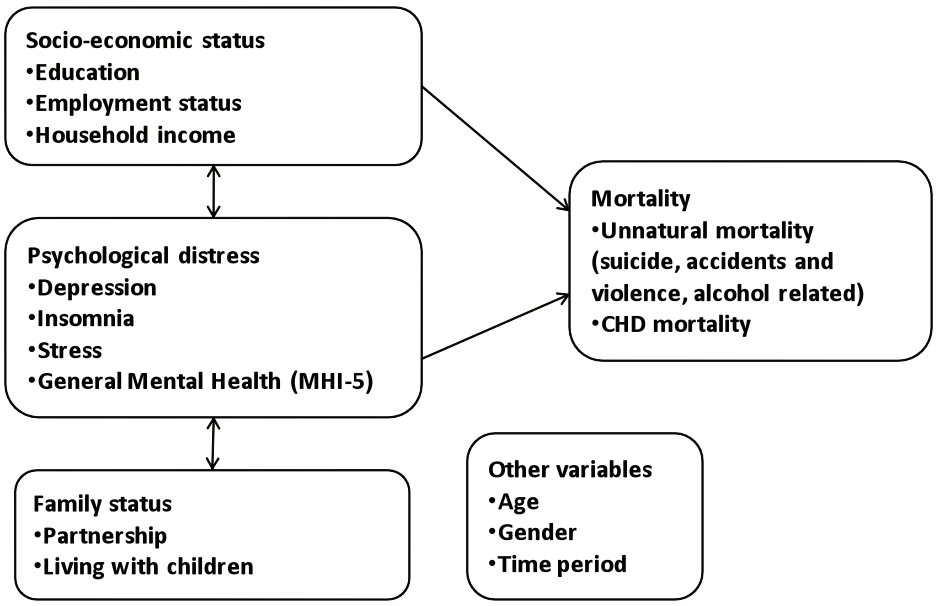


Figure 2. Framework of the study.

5 Data and methods

5.1 Study design and participants

The data is derived from 'Health Behaviour and Health among the Finnish Adult Population' (AVTK), the nationally representative survey conducted annually since 1978 by the National Institute for Health and Welfare (formerly the National Public Health Institute). The main purpose of the monitoring has been to collect information on the health and health behaviour of the working-age population, and on its long- and short-term changes (Helakorpi et al., 2002). This study covers the survey years 1979–2003. Data from 1985 was excluded due to missing personal identification codes for that year. The survey data was supplemented with educational qualification and household income variables from Statistics Finland register data and the Finnish Cause of Death Register follow-up data. Study data and the participants are presented in Table 1.

5.1.1 Survey data

The survey questionnaire was mailed annually to a random sample of 5,000 Finns aged 15–64 years. Respondents under 25 years of age were excluded from this

Table 1. Data and the participants.

Study	Data	N	Exclusion criteria
Substudy I	AVTK 2002–2003	Total 5,425 Men 2,476 Women 2,949	< 25 years old
Substudy II	AVTK 1979–2002; SES Register Data	Total 71,290 Men 34,083 Women 37,207	Year 1985; < 25 years old
Substudy III	AVTK 1979–2002; SES Register Data	Total 70,115 Men 34,493 Women 36,622	Year 1985; < 25 years old; missing data on stress variable
Substudy IV	AVTK 1979–2002; SES Register Data; Cause of Death Register follow-up 1979–2006	Total 67,871 Men 32,451 Women 35,420	Year 1985; < 25 years old; missing data on stress variable

study because their socio-economic status might not yet be established. The total number of cases over the study period 1979–2002 was 71,290, from which 34,083 were men and 37,207 women. The average annual response rate was 75%, of which the average response rate was 71% for men and 79% for women (II-IV). For the study period 2002–2003 (I), the total number of cases was 5,425 (response rate 66%), from which 2,476 were men (response rate 59%) and 2,949 women (response rate 73%). The overall response rate of the survey decreased over the years from over 80% to 65%. Respondents with missing data on the stress variable were excluded from the analyses (N=1129, 1.6%). For depression and insomnia, separating negative responses from missing data was not feasible due to the phrasing of the question.

5.1.2 Register data

Educational qualifications and household income register data was obtained from the population register at Statistics Finland. The register data for education and household income was linked individually from the 1980 statistics for survey years 1979–1983, from the 1985 statistics for survey years 1984–1986 and annually from 1987 until 2000. For survey years 2001–2002, the register data was used from the year 2000.

Mortality data was based on the Finnish Cause of Death Register follow-up for the period 1979–2006. This data includes immediate, contributing and underlying causes of mortality, and exact date of death. The data linkages were carried out on the basis of personal identification codes, which were deleted before analysis.

5.2 Study variables

5.2.1 Psychological distress variables

A description of the study variables is presented in Table 2. Outcome variables were self-reported depression, insomnia, stress and general mental health (MHI-5). Information on depression (‘masentuneisuus’ in Finnish) and insomnia were asked among 14 health problems or symptoms using the question: ‘Have you had any of the following symptoms or health problems during the past 30 days?’ (Yes, if so). Stress was addressed by a four-point scale question: ‘Have you had symptoms of tension or have you been under great stress or considerable strain during the past 30 days?’ (1= my life is nearly unbearable, 2=more than people have in general, 3=somewhat but not usually so, 4=not at all). Those reporting stress ‘more than people have in general’ or ‘my life is nearly unbearable’ were classified as having stress in substudies I and III. Extremely high stress was considered to have the most negative effect on health (Brunner and Marmot, 2006) and to be associated with lowest socio-economic levels. Therefore, an unbearable situation (‘my life is nearly unbearable’) was used as an indicator of stress in

substudy IV related to mortality. Extremely high stress was also used in additional analyses in substudy III. 'Unbearable stress' and 'extremely high stress' are both used to refer to the most extreme category of stress in this study.

General mental health was assessed using a five-item Mental Health Inventory, MHI-5, (included only in survey years 2002–2003), which is a sub-scale of the

Table 2. Study variables.

Substudy	Outcome variables	Independent variables
I	Depression; Insomnia; Stress; MHI-5	Age: continuous, categorical 25–44, 45–64 years; Years of education: basic 0–9, upper secondary 10–14, tertiary 15+ years; Employment status: employed (also including those on sick leave, students, housewives and househusbands)/unemployed/retired (< 65 years); Partnership: having a partner (married or cohabiting)/no partner (single, divorced or widowed) Living with children: no children <18 years living in the household/children <18 years living in the household
II	Depression	Age: categorical 25–34, 35–44, 45–54, 55–64 years; Five study periods; Educational qualification: low/intermediate/high; Household income quintiles; Employment status: employed/unemployed/housewives /students/retired (< 65 years)
III	Insomnia; Stress; Extremely high stress	Age: categorical 25–34, 35–44, 45–54, 55–64 years; Five study periods; Educational qualification: low/intermediate/high; Household income quintiles; Employment status: employed/unemployed/housewives /students/retired (< 65 years)
IV	Unnatural causes of death (suicide, accidents and violence, alcohol-related); Coronary heart disease (CHD) mortality	Age: continuous, age squared; Study year; Educational qualification: low/intermediate/high; Household income tertiles; Employment status: employed/unemployed; Psychological distress: depression, insomnia, extremely high stress

Short Form Health Survey (SF-36) (Ware, 2000). MHI-5 has been recommended as an indicator for psychological distress (Pez et al., 2006) and widely used in population studies (Berwick et al., 1991, Rumpf et al., 2001, Yamazaki et al., 2005). Furthermore, it is assumed to have good validity as a mental health screening instrument (Berwick et al., 1991, Ware and Sherbourne, 1992). The MHI-5 was compounded the following five questions with six choices of answers: 'How much of the time during the last month have you: (1) been a very nervous person; (2) felt calm and peaceful; (3) felt downhearted and blue; (4) been a happy person; (5) felt so down in the dumps that nothing could cheer you up?'. MHI-5 summary variable has a score of 0 to 100, where a score of 100 represents optimal health. The cut-off score ≤ 60, the cut-off point for the lowest quintile, was used as an indicator for poor mental health. Internal consistency of the MHI-5 was acceptable as Cronbach's alpha was 0.86 and the MHI-5 mean score value (74.62, S.D.16.94) was close to the validated Finnish population average (73.7, S.D.19.7)(Aalto A-M et al., 1999).

5.2.2 Socio-economic variables

Socio-economic variables were education, employment status and household income. In the first substudy, education was measured by years of education: basic (0–9 years), upper secondary (10–14 years) and tertiary (15+ years) education from the survey questionnaire. For substudies II-IV, the educational level was derived from the Register of Educational Qualifications and Degrees, which follows the principles and categories of the revised UNESCO International Standard Classification of Education 1997 (ISCED 1997). Respondent's educational qualification was divided into three categories: the lowest level included respondents with no education, an unknown education or with lower secondary education; the intermediate level included respondents with upper secondary or post-secondary non-tertiary education; and the highest level included respondents with tertiary education.

Employment status was queried by the question: 'What kind of work do you do for most of the year?' In the first substudy, employment status consisted of employed, unemployed and retired people. Those on sick leave, students and housewives and househusbands could not be separated from the employed category as the formula of the survey question for employment status had changed between survey years 2002 and 2003. For the second and third substudy, three crude occupational categories that were given in the questionnaire (agricultural, industrial and office work and service) were grouped together for the employed category; additional categories were unemployed, student (> 24 years), retired and housewife/househusband. The results were not reported for the househusband category due to the small number of respondents in this category. The official retirement age for most occupations in Finland is 65, meaning that in this study

data, which included working-age respondents under 65, all the retired respondents had taken early retirement. These comprise early old-age pensioners (62–64 years old), part-time pensioners, disability pensioners and unemployment pensioners (60–64 years old). In the fourth substudy, the employment status measure only included the employed and unemployed categories in order to clarify the interpretation of the results.

Household income was calculated as taxable total gross income per household per year without transfer payment, divided by the consumption unit of the OECD equivalence scale (OECD, 1982). The first adult in the household was weighted as 1.0, other adults as 0.7 and children under 18 as 0.5. Household income per consumption unit was further divided into quintiles (substudy II-III) or tertiles (substudy IV) by every study year in order to retain the comparability of the income variable over time.

The overall prevalence of psychological distress measures and the distribution of socio-economic variables are presented in Table 3. The socio-economic distribution of the data changed somewhat over the study period in question. The number of housewives has decreased, and the number of respondents with higher education and unemployed respondents has increased.

5.2.3 Family status and other variables

The first substudy included measures of partnership and living with children. The partnership status categories were: having a partner (married or cohabiting) and no partner (single, divorced or widowed). Living with children included two categories; ‘no children’ and ‘children under 18 years living in the household’. The relationship between these family status variables and psychological distress was only explored in the first substudy, as the main interest and focus of this doctoral thesis was differences over time related to socio-economic variables.

Other variables included gender, age and study period. Age was used as a continuous, categorical and age squared variable. For substudies II and III, the total study period was divided into five study periods. All the analyses were performed separately for men and women.

Table 3. The overall prevalence of psychological distress measures and distribution of socio-economic variables by study period (%).

Study periods	1979–1982	1983–1987	1988–1992	1993–1997	1998–2002	Total period 1979–2002
Men						
Depression (I,II,IV)	16	13	13	15	14	14
Insomnia (I,III,IV)	17	16	17	18	20	18
Stress (I, III)	16	17	19	20	20	19
Extremely high stress (III, IV)	-	-	-	-	-	2.6
Education (qualification)						
Highest	20	22	25	28	33	25
Intermediate	26	31	35	39	41	34
Lowest	54	47	40	33	27	41
Employment Status						
Employed	86	85	82	73	78	81
Student	2	1	2	2	2	2
Unemployed	2	3	3	12	8	5
Retired (< 65 years)	10	11	12	13	12	12
Household income**						
Women						
Depression (I,II,IV)	21	18	17	19	17	18
Insomnia (I,III,IV)	19	17	17	19	21	19
Stress (I, III)	12	14	15	19	18	16
Extremely high stress (III, IV)	-	-	-	-	-	2.4
Education (qualification)						
Highest	16	22	26	33	37	27
Intermediate	26	31	35	37	39	34
Lowest	58	47	39	30	24	40
Employment Status						
Employed	69	74	75	69	73	72
Student	1	2	3	3	3	2
Housewife	16	12	9	8	6	10
Unemployed	2	2	2	9	8	5
Retired (< 65 years)	12	11	11	10	10	11

*data for 1985 is missing

** Household income was divided into equal size categories which are not shown in the table

Table 4. The classification for causes of death.

Cause of death	ICD-8	ICD-9	ICD-10
Suicide	E950–E959	E950–E959	X60–X84
Accidents and violence	E800–E859, E861–E949, E960–E999	E800–E849, E852–E949, E960–E999	V00–V99, W00–W99, X00–X44, X46–X59, X85–X99, Y00–Y89
Alcohol-related deaths	291, 303, 571.0, 577, E860	291, 303, 357.5, 425.5, 535.3, 571.0–571.3, 577.0D–577.0F, 577.1C–577.1D E851	F10, G31.2, G62.1, G72.1, I42.6, K29.2, K70, K86.0, O35.4, X45
CHD mortality	410–414	410–414	I20–I25

5.2.4 Mortality

Substudy IV included mortality data, which was used to examine the specific causes of death that have previously shown to be associated both with psychological distress and SES. Those included unnatural causes of death such as suicide, accidents and violence, and alcohol-related mortality; and, for purposes of comparison a general cause of death, namely coronary heart disease (CHD) mortality.

The immediate causes of death were identified using the International Classification of Diseases (ICD, WHO; 1974, 1978, 1992) (Table 4). The 8th revision was used for the years 1979–1986, the 9th revision for the years 1987–1995 and the 10th revision for the years subsequent to 1996. The definition of alcohol-related deaths included injuries, diseases and poisonings where alcohol was the main cause of the death.

5.3 Statistical methods

Data management and all statistical analyses were carried out using SPSS 14–17 for Windows (SPSS Corporation 2005–2008). General descriptive analyses were performed with a view to presenting the general prevalence and distribution of the data (Table 3). All the analyses were conducted separately for men and women.

Pearson's correlations were calculated to assess the associations between the different measures of psychological distress. These were explored in particular in order to compare less specific measures of psychological distress with MHI-5, which is a validated measure of general mental health and psychological distress. All the psychological distress variables had statistically significant correlations with each other (Table 5). The strongest Pearson's correlation ($p < 0.01$) was ob-

Table 5. Intercorrelations between psychological distress measures ($p < 0.01$).

	1	2	3	4	5
(1) MHI-5 (2002–2003)	1	.58	.38	.63	.21
(2) Depression	.55	1	.37	.40	.24
(3) Insomnia	.38	.34	1	.29	.16
(4) Stress	.62	.38	.26	1	-
(5) Extremely high stress	.15	.21	.14	-	1

*Males, above diagonal; females, below diagonal

served between MHI-5 and stress (males r = 0.63; females r = 0.62), and between MHI-5 and depression (males r = 0.58; females r = 0.55).

For substudies II and III, the age-standardized trend was conducted to illustrate the prevalence of self-reported depression, insomnia and stress during the different study periods between 1979–2002. Age standardization facilitates the comparison of groups of differing age composition. A direct standardization method was applied using the total study population as a standard population (Tunstall-Pedoe, 2003). The statistical significance of the change in trend was tested by means of logistic regression analysis.

In order to evaluate the socio-economic differences in psychological distress (substudies I-III), a series of logistic regression analyses were performed in two steps. The first analyses explored the age-adjusted main effects of each explanatory socio-economic (substudies I-III) and family status variable (substudy I). In the second model, all explanatory variables were analysed simultaneously to see whether their effect remained independent. The highest educational level, employed respondents, highest household income level, those with a partner and those living with children < 18 years were used as reference groups. The results were presented as odds ratio (OR) estimates and their 95% confidence intervals (95% CI). Moreover, in substudy III, self-reported depression was included as a covariate in the last model in order to exclude the possible effect of depression on insomnia and stress. Additional logistic regression analysis for the extremely high stress category (prevalence rate of 2.5 %) by socio-economic indicators was conducted in order to examine the robustness of the stress outcome (substudy III).

For substudies II and III, the data was divided into five study periods, and interaction effects between socio-economic variables and the study period were tested and reported as p-values in order to explore the possible changes in socio-economic differences in self-reported depression, insomnia and stress over time.

For substudy IV, two preliminary analyses were conducted to confirm the basic presumptions for the meditational hypothesis (Baron and Kenny, 1986). First, the associations between psychological distress and socio-economic status were examined in the logistic regression analyses reporting odds ratio (OR) estimates

and their 95% confidence intervals (95% CI). The second analysis was conducted to show the association between psychological distress and cause-specific mortality with a Cox proportional hazard model reporting hazard ratio (HR) estimates and their 95% confidence intervals (95% CI). The main analyses that explored socio-economic status associated with cause-specific mortality were conducted using the Cox proportional hazard model. Base model included covariates such as age, age squared and study year. In order to take into account the non-linear association of age with unnatural mortality, analyses for mortality were adjusted for age and age squared. Variation over time was taken into account by adjusting for the study year. The base model was further adjusted for depression, insomnia and stress variables first separately and, finally, for all of them simultaneously to see whether those variables contributed to the socio-economic disparities in mortality. To assess the impact of the adjustment of different variables on the base model hazard ratio, the percentage reduction of the HR was calculated as follows: [(base model HR-base model plus other factors HR)/(base model HR–1)] x 100 (Lynch et al., 1996, Laaksonen et al., 2007). The reduction in the hazard ratio was interpreted to express how much of the association between the individual socio-economic variables and mortality was accounted for by the measures of psychological distress.

6 Results

6.1 Time trends in the prevalence of psychological distress (II-III)

The overall prevalence for self-reported depression was 14% among men and 18% among women; for insomnia 18% among men and 19% among women; for stress 16% among men and 19% among men; and for poor mental health (MHI-5) 20% among men and 19% among women. Depression and insomnia were more prevalent among women and stress among men at all times. Trends in the prevalence for depression, insomnia and stress are presented in Figures 3–5. For depression, the change over time was non-linear as the prevalence fluctuated starting with a considerable decrease, especially among women during the 1980s, followed by a slight increase in 1993–1997. However, compared to the first study period 1979–1982, there was a statistically significant decline in depression among women ($p < 0.001$) (Figure 3).

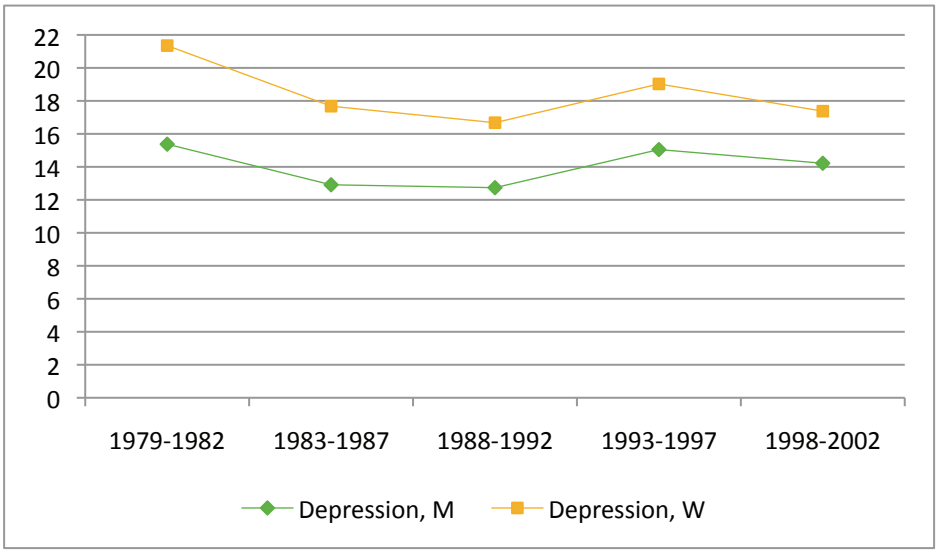


Figure 3. Age-standardized over time prevalence of depression 1979–2002 (%).

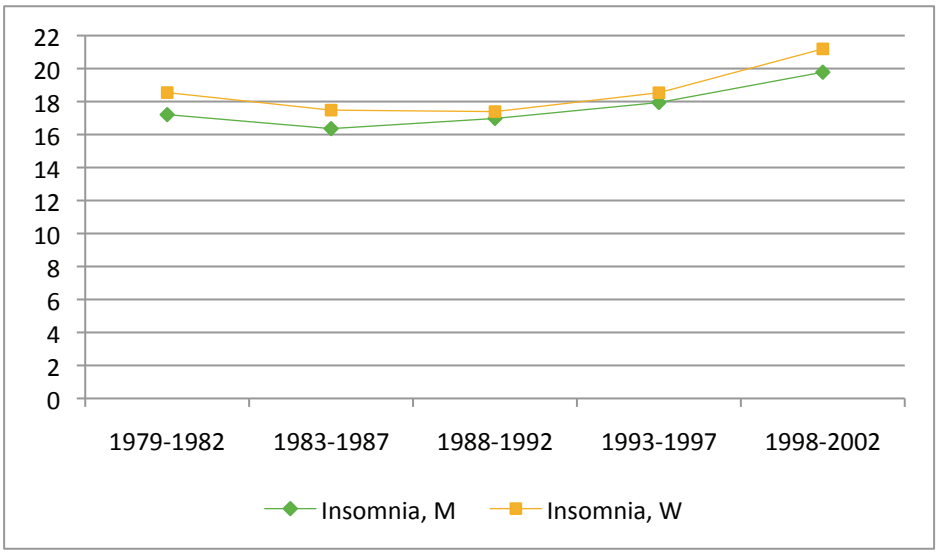


Figure 4. Age-standardized over time prevalence of insomnia 1979–2002 (%).

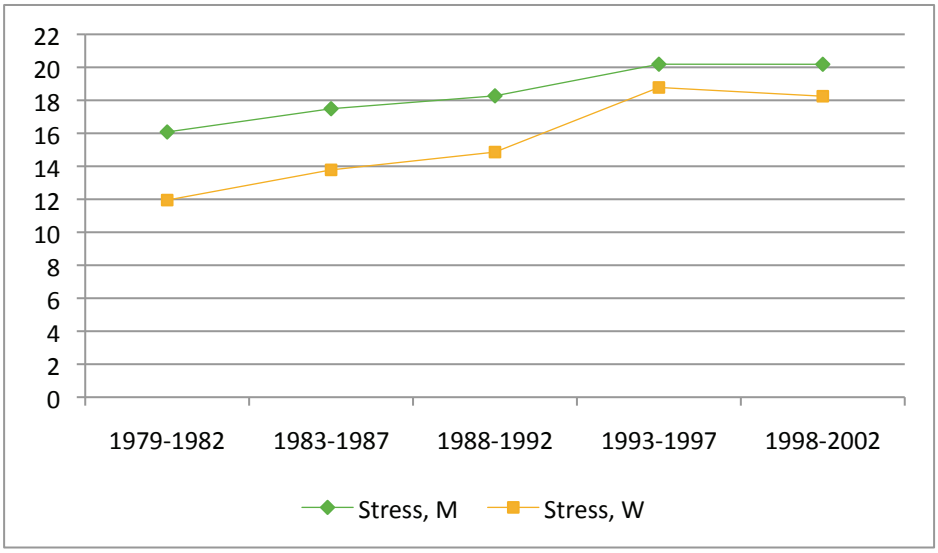


Figure 5. Age-standardized over time prevalence of stress 1979–2002 (%).

The prevalence of insomnia also slightly decreased after the first study period, but then showed an increase over the latest study periods (Figure 4). During the last study period, 1998–2002, there was a statistically significant ($p < 0.001$) increase of almost three percentage points in insomnia among both men and women compared to the first study period. The prevalence of stress showed a linear increase until the study period 1993–1997 among both genders, indicating a statistically significant ($p < 0.001$) four to seven percentage point increase compared to the first study period (Figure 5). For the last study period, 1998–2002, the prevalence of stress remained similar to the 1993–1997 study period.

6.2 Socio-economic and family status differences in psychological distress (I-III)

6.2.1 Educational level differences in psychological distress (I-III)

Compared to the highest education, which was measured based on the educational qualification, those with lower levels of education had more self-reported depression and insomnia during the total study period 1979–2002 in the age-adjusted model among both genders (II-III, Tables 6 and 7). However, after simultaneous adjustment for all SES variables, the associations only remained for those with lower educational levels in insomnia among men. Conversely, those with the lowest and intermediate levels of education among both men and women experienced less stress. Those associations with stress remained statistically significant even after mutual adjustment for other SES variables.

The extremely high stress category (‘my life is nearly unbearable’) as an outcome measure resulted in reversed educational differences compared to the original wider stress classification; in the age-adjusted model, intermediate level, and those with lowest educational level had more extremely high stress compared to the highest educated among both men (OR 1.37, 95% CI 1.13–1.65) and women (OR 1.47, 95% CI 1.21–1.78) (III, IV, not displayed in the tables). However, after mutual adjustment for other SES variables, those educational level differences were no longer statistically significant.

The lowest education measured in years of education (I, not shown in tables) was associated with poor mental health (MHI-5) among women and intermediate education with poor mental health among men, even after simultaneous adjustment for all other SES and family status variables. Reversed and non-linear gradients were demonstrated in insomnia and stress; the lowest educated as measured by years of education had less insomnia and less stress among men, and moreover, those women in the intermediate education category had less stress.

Table 6. Adjusted odds ratios (95% CI) for self-reported depression, insomnia and stress by educational level (qualification), employment status and household income level during 1979–2002, men.

	Depression				**Insomnia**				**Stress**			
	Age-adjusted		Fully adjusted[1]		Age-adjusted		Fully adjusted[1]		Age-adjusted		Fully adjusted[1]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Education												
Highest	1.00		1.00		1.00		1.00		1.00		1.00	
Intermediate	**1.22**	**1.12-1.33**	1.07	0.98-1.17	**1.13**	**1.04-1.22**	**1.09**	**1.00-1.18**	**0.76**	**0.71-0.82**	**0.73**	**0.68-0.79**
Lowest	**1.30**	**1.19-1.41**	1.05	0.96-1.15	**1.20**	**1.11-1.29**	**1.11**	**1.02-1.20**	**0.75**	**0.70-0.80**	**0.69**	**0.64-0.75**
Employment Status												
Employed	1.00		1.00		1.00		1.00		1.00		1.00	
Student	**1.39**	**1.12-1.73**	**1.34**	**1.08-1.67**	**1.44**	**1.17-1.77**	**1.43**	**1.16-1.76**	**1.24**	**1.01-1.52**	1.15	0.93-1.41
Retired	**2.64**	**2.38-2.92**	**2.40**	**2.15-2.67**	**2.18**	**1.99-2.39**	**2.16**	**1.96-2.38**	**1.52**	**1.37-1.68**	**1.56**	**1.40-1.73**
Unemployed	**3.30**	**2.95-3.69**	**2.94**	**2.62-3.31**	**2.48**	**2.22-2.76**	**2.42**	**2.16-2.71**	**1.68**	**1.50-1.87**	**1.65**	**1.46-1.86**
Household Income												
Highest	1.00		1.00		1.00		1.00		1.00		1.00	
2nd highest	1.11	0.99-1.23	1.04	0.94-1.16	0.95	0.87-1.04	**0.89**	**0.81-0.98**	**0.81**	**0.74-0.89**	**0.86**	**0.78-0.94**
Middle	**1.27**	**1.14-1.40**	**1.12**	**1.00-1.25**	0.96	0.88-1.06	**0.85**	**0.77-0.94**	**0.81**	**0.74-0.88**	**0.86**	**0.78-0.94**
2nd lowest	**1.39**	**1.25-1.54**	**1.12**	**1.00-1.25**	0.98	0.90-1.08	**0.81**	**0.73-0.89**	**0.79**	**0.72-0.86**	**0.81**	**0.74-0.89**
Lowest	**1.81**	**1.64-1.99**	**1.29**	**1.16-1.44**	**1.34**	**1.23-1.46**	0.98	0.89-1.08	**1.12**	**1.03-1.21**	**1.31**	**1.03-1.24**

[1]Adjusted for age, study period and other socio-economic factors.

*Significant odds ratios in bold

6.2.2 Employment status differences in psychological distress (I-III)

Employment status was associated with psychological distress among both men and women (I-III). Over the total period 1979–2002, the unemployed and the retired (<65 years) had consistently more depression, insomnia and stress among both men (Table 6) and women (Table 7) compared to the employed, even after adjusting for other socio-economic factors. Housewives had more depression in the age-adjusted model but this was not statistically significant following mutual adjustment for education and household income. However, housewives had less stress in both models.

After further adjustment for self-reported depression as a covariate in the models related to insomnia and stress (III, not shown in tables), statistically significant associations in stress vanished for the retired and unemployed respondents among both men and women.

Table 7. Adjusted odds ratios (95% CI) for self-reported depression, insomnia and stress by educational level (qualification), employment status and household income level during 1979–2002, women.

	Depression				**Insomnia**				**Stress**			
	Age-adjusted		Fully adjusted[1]		Age-adjusted		Fully adjusted[1]		Age-adjusted		Fully adjusted[1]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Education												
Highest	1.00		1.00		1.00		1.00		1.00		1.00	
Intermediate	**1.09**	**1.02-1.17**	1.00	0.93-1.08	1.00	0.93-1.08	0.98	0.91-1.06	**0.79**	**0.74-0.85**	**0.76**	**0.71-0.82**
Lowest	**1.20**	**1.11-1.29**	1.05	0.97-1.13	**1.12**	**1.04-1.21**	1.06	0.98-1.15	**0.80**	**0.74-0.86**	**0.76**	**0.70-0.82**
Employment Status												
Employed	1.00		1.00		1.00		1.00		1.00		1.00	
Student	**1.28**	**1.08-1.50**	1.18	0.99-1.39	1.18	0.98-1.43	1.18	0.98-1.43	**1.57**	**1.33-1.85**	**1.45**	**1.22-1.71**
Housewife	**1.17**	**1.07-1.28**	1.10	0.99-1.20	1.01	0.92-1.11	0.99	0.90-1.10	**0.79**	**0.71-0.88**	**0.75**	**0.67-0.84**
Retired	**2.15**	**1.95-2.36**	**1.99**	**1.80-2.20**	**1.70**	**1.56-1.86**	**1.66**	**1.51-1.82**	**1.36**	**1.22-1.52**	**1.29**	**1.16-1.45**
Unemployed	**2.30**	**2.06-2.58**	**2.10**	**1.87-2.36**	**1.80**	**1.60-2.02**	**1.74**	**1.55-1.96**	**1.45**	**1.28-1.64**	**1.37**	**1.20-1.55**
Household Income												
Highest	1.00		1.00		1.00		1.00		1.00		1.00	
2nd highest	1.07	0.98-1.16	1.04	0.95-1.14	0.96	0.88-1.04	**0.89**	**0.81-0.98**	**0.86**	**0.79-0.94**	**0.90**	**0.83-0.99**
Middle	1.06	0.98-1.16	0.99	0.90-1.08	**0.91**	**0.84-0.99**	**0.85**	**0.77-0.94**	**0.81**	**0.74-0.89**	**0.86**	**0.78-0.94**
2nd lowest	**1.21**	**1.11-1.32**	1.07	0.97-1.17	1.03	0.95-1.12	**0.81**	**0.73-0.89**	**0.89**	**0.81-0.97**	0.95	0.86-1.04
Lowest	**1.54**	**1.42-1.68**	**1.24**	**1.13-1.36**	**1.17**	**1.08-1.27**	0.98	0.89-1.08	**1.18**	**1.08-1.29**	**1.26**	**1.14-1.39**

[1]Adjusted for age, study period and other socio-economic factors.
*Significant odds ratios in bold

In the survey years 2002–2003 (I), the unemployed and the retired (<65 years) had more depression and poor mental health (MHI-5) among both genders and insomnia among men compared to the employed, even after mutual adjustment for other SES and family status variables (not displayed in the tables). In addition, unemployed men had more stress. Retired (<65 years) respondents had not statistically significantly higher stress in the 2002–2003 data.

6.2.3 Household income level differences in psychological distress (II-III)

Compared to the highest income level, those with the lowest income had more self-reported depression, insomnia and stress among men (Table 6) and women (Table 7) in the period 1979–2002 in the age-adjusted model (II-IV). Depression and stress remained more common in the lowest household income category, even

after adjusting for the other socio-economic factors. However, after simultaneous adjustment for education and employment status, the association of insomnia with household income level turned U-shaped as the intermediate levels of income had the lowest insomnia. Moreover, there was a curvilinear association with stress, which was least common among the intermediate levels of income, even after adjustment for education and employment status.

After further adjustment for self-reported depression as a covariate in the models related to insomnia and stress (III, not shown in tables), the lowest income level was no longer statistically significantly associated with stress among men.

6.2.4 Family status differences in psychological distress (I)

Family status was only studied with 2002–2003 data (I, not shown in tables). Respondents having no partner reported more depression, poor mental health (MHI-5), insomnia and stress in all the models among both men and women.

Compared to those living with children under 18, women with no children under 18 in the household reported more psychological distress by all measures in the age-adjusted model. In the fully adjusted model, the association remained statistically significant only with insomnia; women with no children under 18 in the household experienced more insomnia. In men, in the age-adjusted model having no children under 18 in the household was associated with more insomnia and poor mental health. However, after mutual adjustment for other variables, only statistically significant reversed association was found in stress; men living with no children under 18 had less stress than men with children under 18 living in the household. Additional analyses with categories of children under 7 years and those between 7 and 17 years made no difference to the results.

6.3 Time trends in socio-economic differences in psychological distress (II-III)

6.3.1 Trends in psychological distress by educational and household income level over time

The temporal changes in educational and household income level differences were found in stress, whereas changes in depression and insomnia by educational or household income level were not statistically significant among either gender.

Among men, there was statistically significant change in stress by income level in 1979–2002 (Table 8, p=0.036). During the early study periods there were no statistically significant differences in stress between the highest and lowest income levels. However, over the last two study periods differences emerged owing to a pronounced increase in stress among those with the lowest levels of household income.

Table 8. Adjusted odds ratios for self-reported depression, insomnia and stress by educational level (qualification), employment status and household income level during different study periods between 1979–2002, men. Adjusted for age and other socio-economic factors.

	Depression					**Insomnia**					**Stress**				
	79-82	83-87	88-92	93-97	98-02	79-82	83-87	88-92	93-97	98-02	79-82	83-87	88-92	93-97	98-02
Education															
Highest	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Intermediate	1.04	0.96	1.17	1.18	0.99	1.04	1.02	1.07	1.14	1.13	**0.70**	**0.68**	**0.75**	**0.78**	**0.73**
Lowest	1.05	0.97	1.12	**1.23**	0.96	1.01	1.00	1.16	1.19	1.17	**0.67**	**0.62**	**0.74**	**0.82**	**0.65**
Interaction study period*education p=0.862[1]						p=0.858[1]					p=0.556[1]				
Employment status															
Employed	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Student	1.13	0.99	1.29	**2.26**	1.08	1.48	1.10	1.19	1.37	**1.88**	1.30	0.82	1.14	**1.53**	0.83
Retired	**2.60**	**2.30**	**2.44**	**2.24**	**2.54**	**2.71**	**2.49**	**2.13**	**2.12**	**1.68**	**2.00**	**1.91**	**1.43**	1.18	**1.58**
Unemployed	**2.84**	**4.15**	**3.86**	**2.47**	**2.88**	**2.57**	**3.13**	**3.05**	**2.10**	**2.24**	**1.73**	**2.05**	**2.18**	1.21	**1.69**
Interaction study period* employment status p=0.066[1]						p=0.025[1]					p<0.001[1]				
Household income															
Highest	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2nd highest	1.13	1.03	0.90	1.06	1.08	0.98	1.00	**0.69**	0.88	0.98	0.86	**0.80**	0.84	0.94	0.84
Middle	1.15	1.20	0.96	1.12	1.20	0.96	1.04	**0.73**	**0.78**	0.83	0.89	0.86	**0.68**	1.16	**0.79**
2nd lowest	**1.35**	0.97	1.09	0.96	1.18	0.89	0.83	**0.81**	**0.69**	0.81	0.88	**0.74**	**0.75**	0.95	**0.77**
Lowest	**1.37**	**1.31**	0.92	**1.42**	**1.49**	1.00	1.09	0.81	0.94	1.08	1.06	1.00	0.91	**1.43**	**1.29**
Interaction study period* household income p=0.079[1]						p=0.204[1]					p=0.036[1]				

[1]Adjusted for other SES and study period interactions

*Significant odds ratios in bold

In women, the educational level differences changed over time in stress (Table 9, p=0.041). During the first study period no differences existed. However, owing to the steep increase in stress among the highest educated over the two periods that followed, statistically significant inverse differences arose; those with the lower levels of education reported less stress compared to those in the highest educational level. However, during the last period the differences narrowed again due to an increase in stress among the lowest educational level.

In women, changes in household income level differences in stress were statistically significant in the age-adjusted models (not shown in the tables), but no longer in the mutually adjusted model (Table 9).

Table 9. Adjusted odds ratios for self-reported depression, insomnia and stress by educational level (qualification), employment status and household income level during different study periods between 1979–2002, women. Adjusted for age and mutually for other socio-economic factors.

	Depression					**Insomnia**					**Stress**				
	79-82	83-87	88-92	93-97	98-02	79-82	83-87	88-92	93-97	98-02	79-82	83-87	88-92	93-97	98-02
Education															
Highest	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Intermediate	1.11	0.94	0.96	1.02	1.02	0.97	0.92	1.05	1.05	1.00	0.84	**0.66**	**0.66**	**0.83**	**0.85**
Lowest	1.18	0.97	0.99	1.03	1.10	1.01	1.09	1.07	1.07	0.99	0.95	**0.68**	**0.61**	**0.75**	0.92
Interaction study period*education p=0.733[1]						p=0.196[1]					p=0.041[1]				
Employment status															
Employed	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Students	0.74	1.30	**1.40**	0.98	1.35	1.16	0.96	0.81	1.22	1.37	**2.07**	1.29	**2.01**	1.07	1.27
Housewife	1.11	1.14	1.02	1.09	1.07	1.03	1.06	1.02	1.00	0.76	1.00	0.70	**0.70**	**0.68**	**0.67**
Retired	**1.96**	**2.09**	**1.84**	**2.00**	**2.25**	**1.93**	**1.59**	**1.65**	**1.76**	**1.55**	**1.91**	**1.59**	1.17	1.03	1.11
Unemployed	**2.30**	**2.36**	**2.56**	**1.78**	**2.25**	**1.65**	**1.92**	**2.02**	**1.66**	**1.92**	**2.06**	1.37	**1.74**	0.99	**1.55**
Interaction study period* employment status p=0.649[1]						p=0.024[1]					P<0.001[1]				
Household income															
Highest	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2nd highest	0.98	1.03	0.99	1.07	1.13	0.97	1.06	0.88	0.93	**0.83**	0.84	1.07	0.86	0.94	**0.82**
Middle	1.07	0.80	0.99	0.99	1.07	0.89	0.85	0.84	**0.76**	0.88	0.99	0.79	**0.80**	0.88	0.85
2nd lowest	0.99	1.22	1.01	1.07	1.03	0.98	0.99	0.86	0.85	0.92	1.00	1.08	**0.81**	1.01	0.90
Lowest	**1.24**	1.17	1.04	**1.32**	**1.38**	1.07	0.98	0.98	0.86	0.88	1.27	1.25	1.11	**1.47**	1.11
Interaction study period* household income p=0.086[1]						p=0.897[1]					p=0.337[1]				

[1]Adjusted for other SES and study period interactions

*Significant odds ratios in bold

6.3.2 Trends in psychological distress by employment status over time

Changes in employment status differences over time were statistically significant in insomnia and stress, but not in depression. In insomnia, there was interaction between the study period and employment status among men (p=0.025; Table 8) and women (p=0.024; Table 9). Changes were most explicit during the recession and period of high unemployment in 1993–1997, when differences in insomnia narrowed between the employed and unemployed respondents owing to the decrease in insomnia among the unemployed.

Employment status differences in stress changed among men ($p < 0.001$; Table 8) and women ($p < 0.001$; Table 9). Similar to insomnia, during the period of high unemployment in 1993–1997, differences in stress narrowed between employed and unemployed respondents due to the decrease in stress among the unemployed. However, the narrowing of the differences in stress by employment status ($p < 0.001$) during the recession was even more pronounced than in insomnia, as the statistically significant differences ceased to exist.

6.4 The contribution of psychological distress to socio-economic differences in unnatural and CHD mortality (IV)

The IV substudy explored whether self-reported psychological distress, measured by depression, insomnia and extremely high stress, mediated the socio-economic differences in unnatural (suicide, accidents and violence, alcohol-related) and coronary heart disease (CHD) mortality. The total number of deaths for unnatural causes was 716 for men and 222 for women, while the numbers for CHD mortality were 1,389 for men and 635 for women, over a 28-year follow-up period.

Two preliminary analyses were conducted in order to confirm the basic assumptions for the modelling, which were the association between SES and psychological distress as well as the association between psychological distress and cause-specific mortality. In the first preliminary logistic regression analysis; depression, insomnia and extremely high stress were confirmed to be associated with the lowest level of education, unemployment and the lowest household income level. In the second preliminary analysis based on the Cox proportional hazard model, it was demonstrated that depression (M: HR 2.36, 95 % CI 2.00–2.79; W: HR 2.43, 95 % CI 1.85–3.21), insomnia (M: HR 2.93, 95 % CI 2.51–3.41; W: HR 2.29, 95 % CI 1.73–3.04) and extremely high stress (M: HR 3.37, 95 % CI 2.54–4.49; W: HR 4.04, 95 % CI 2.49–6.55) were associated with unnatural mortality. Respectively, it was demonstrated that depression (M: HR 1.35, 95% CI 1.17–1.56; W: HR 1.43, 95% CI 1.19–1.72), insomnia (M: HR 1.33, 95% CI 1.17–1.51; W: HR 1.25, 95% CI 1.06–1.48) and extremely high stress (M: HR 1.76, 95% CI 1.32–2.35; W: HR 2.34, 95% CI 1.59–3.44) were associated with coronary heart disease mortality.

6.4.1 Contribution of psychological distress to educational level differences in unnatural and CHD mortality

In men, the lowest level of education was associated with excess unnatural (HR 1.58, 95% CI 1.28–1.94; Table 10) and CHD mortality (HR 1.36, 95% CI 1.16–1.59, data not shown in the table). Adjustment for self-reported depression, insomnia and extremely high stress, when considered both separately and simultaneously, resulted in a modest reduction in the educational level differences in unnatural mortality (5–12%), and no change in CHD mortality (0–5%). In women,

Table 10. The effect of adjusting for self-reported psychological distress on educational level (qualification), employment status and income level differences in unnatural mortality, men and women. Hazard ratios (95% CI) and reduction (%) in mortality among those with a low SES compared to those with a high SES after adjusting for psychological distress.

	Men			**Women****		
		HR (95% CI)			**HR (95% CI)**	
Education	**High**	**Low**	**%**			
1 confounders*	1	1.58 (1.28–1.94)				
1+depression	1	1.53 (1.25–1.89)	-9			
1+ extremely high stress	1	1.55 (1.26–1.91)	-5			
1+insomnia	1	1.55 (1.24–1.88)	-9			
1+all above	1	1.51 (1.23–1.85)	-12			
Employment status	**Employed**	**Unemployed**		**Employed**	**Unemployed**	**%**
1 confounders*	1	4.12 (3.26–5.21)		1	3.50 (2.13–5.75)	
1+depression	1	3.50 (2.75–4.44)	-20	1	3.09 (1.87–5.11)	-16
1+ extremely high stress	1	3.78 (2.98–4.79)	-11	1	3.22 (1.95–5.32)	-11
1+insomnia	1	3.45 (2.72–4.36)	-21	1	3.15 (1.91–5.19)	-14
1+all above	1	3.15 (2.47–4.00)	-31	1	2.86 (1.73–4.73)	-26
Household income level	**High**	**Low**		**High**	**Low**	
1 confounders*	1	1.70 (1.42–2.04)		1	1.80 (1.29–2.50)	
1+depression	1	1.62 (1.35–1.94)	-11	1	1.73 (1.24–2.40)	-9
1+ extremely high stress	1	1.65 (1.38–1.98)	-7	1	1.73 (1.24–2.40)	-9
1+insomnia	1	1.65 (1.38–1.98)	-7	1	1.77 (1.27–2.46)	-4
1+all above	1	1.59 (1.33–1.92)	-16	1	1.69 (1.21–2.35)	-14

*The confounders: age, age squared, study year

**No excess unnatural mortality by education among women

there were no educational level differences in unnatural mortality. With CHD mortality, the contribution of psychological distress was equivalent to men and explained only 2–6% of the educational differences in CHD mortality (not shown in the table).

6.4.2 Contribution of psychological distress to employment status differences in unnatural and CHD mortality

Unemployment was associated with higher unnatural mortality (Table 10) among both men (HR 4.12, 95% CI 3.26–5.21) and women (HR 3.50, 95% CI 2.13–5.75); and with higher CHD mortality (data not shown in the table) among men (HR 2.06, 95% CI 1.58–2.68) and women (HR 1.91, 95% CI 1.18–3.11). Separately, depression, insomnia and extremely high stress accounted for 11–21% of the excess mortality in unemployed men and 11–16% in women for unnatural causes of death. Combined adjustment of the measures of psychological distress resulted in further reductions (26–31%) in excess unnatural mortality among the unemployed. In CHD mortality, psychological distress contributed at the most 9% for the employment status differences in CHD mortality among both genders.

6.4.3 Contribution of psychological distress to household income level differences in unnatural and CHD mortality

In the base model, when compared to the highest income, those in the lowest household income level had elevated unnatural mortality (Table 10) among men (HR 1.70, 95% CI 1.42–2.04) and women (HR 1.80, 95% CI 1.29–2.50), and elevated CHD mortality (data not shown in the table) among men (HR 1.58, 95% CI 1.38–1.81) and women (HR 2.13, 95% CI 1.71–2.65). Self-reported depression, insomnia and extremely high stress accounted for 4–16% of unnatural mortality among those in the lowest income level after separate or combined adjustment for psychological distress measures (Table 10). Again, psychological distress measures did not explain much (0–5%) of the household income level differences in CHD mortality among either gender.

7 Discussion

7.1 Main findings

The overall aim of the present study was to provide new information about changes in the prevalence of psychological distress; changes in the socio-economic differences in psychological distress over time; and to explore the role of psychological distress in mediating socio-economic differences in cause-specific mortality.

The first aim was to explore trends in the prevalence of depression, insomnia and stress over time. Compared to the first study period 1979–1982, insomnia and stress increased among men and women; whereas depression declined among women.

The second aim was to study socio-economic and family status associated with different dimensions of psychological distress. Among men, lower educational qualification was associated with more insomnia, whereas the lowest education measured in years was associated with less insomnia and less stress among men and poor mental health (MHI-5) among women. Those with the highest educational qualification had more stress among men and women, however, extremely high stress was more common among those with lower education. The unemployed and the retired (<65 years) had more depression, insomnia, stress and poor mental health (MHI-5). Those in the lowest household income group had more depression and stress. Moreover, the association of household income with stress was curvilinear; stress was the least common among the intermediate levels of income. The relationship between income and insomnia was less robust. Respondents who did not have a partner reported poor general mental health (MHI-5), more depression, insomnia and stress. Respondents who had no children under 18 years living in the household reported more insomnia among women and less stress among men.

The third aim was to study socio-economic differences in self-reported depression, insomnia and stress over time. Some of the changes over time showed statistical significance. However, in general, socio-economic differences in psychological distress did not change substantially over the study period 1979–2002. Related to employment status, differences between unemployed and employed respondents narrowed during the period of high unemployment between 1993–1997, especially in stress and insomnia. In addition, over the latter study periods, pronounced income level differences emerged in stress among men, and reversed educational level differences emerged in stress among women after the first study period. There were no significant temporal changes in depression.

The final aim was to explore the contribution of psychological distress (depression, insomnia and extremely high stress) on excess cause-specific mortality in different socio-economic groups. Psychological distress accounted for 4–31% of the socio-economic differences in unnatural mortality, but not in CHD mortality. In unnatural mortality (suicide, accidents and violence, and alcohol-related mortality), psychological distress partly accounted for the employment status and income level differences among both genders, and the differences related to the educational level among men; among women there were no educational level differences in unnatural mortality.

7.2 Discussion of the findings

7.2.1 Trends in the prevalence of psychological distress over time

Few studies have explored trends over time on the prevalence of depression and insomnia, and even fewer on the prevalence of stress.

After the first study period, the prevalence of self-reported depression and insomnia showed a decreasing trend. Some of this may be due to the decreasing proportion of those cohorts who had experienced wartime between 1939–1944, which may have predisposed people to psychological symptoms and sleeping problems, especially among men. However, the prevalence of stress showed a linear increase until the study period 1993–1997.

At the beginning of the 1990s, Finland experienced its most severe financial crisis to date, which resulted in an unemployment rate of up to 17% (Statistics Finland, 2007) and loss of income for a wide proportion of the population, irrespective of socio-economic background. Psychological well-being is hypothesised to deteriorate during periods of economic recession and high unemployment, and this has gained support from a number of previous studies in Finland and Sweden (Ahola, 1995, Rahmqvist and Carstensen, 1998). In the present study over the years of recession between 1993 and 1997, psychological distress also showed a moderate increase in all measures, however, least in insomnia. The increase was most prominent among the lowest household income groups in depression and stress. The Finnish longitudinal cohort study found no drastic decline in sleep quality during 1992–1995 compared to the 1983–1987 baseline except among the prospectively unemployed, most of whom were blue-collar workers (Hyyppä et al., 1997).

After the recession during the period 1998–2002, depression declined among women. The decline in depression among women was apparent among all the socio-economic groups, except in those with lowest education and the retired (<65 years), where the prevalence of depression fluctuated but in the long run remained at the same level. The trend in suicide mortality, which is closely related to depression, has been decreasing since the early 1990s in Finland, especially

among men (Lönnqvist, 2006). The detection and treatment of mental health problems, especially depression, and the growing acceptance of depression as a treatable condition, is proposed as one of the contributing factors for the decrease in suicide mortality.

Contrary to depression, after recession, in the period 1998–2002 insomnia increased among both genders. Few studies that have examined trends over time in insomnia have found similar evidence for an increase in symptoms. In a Finnish review and re-analysis, insomnia-related symptoms increased during the period 1995–2005, particularly among the employed working-age population (Kronholm et al., 2008), and in a Swedish population study of women, the proportion of respondents with sleeping problems almost doubled between 1968 and 2004 (Rowshan Ravan et al., 2010). Yet unpublished results indicate a further increase in insomnia after 2005 in Finland (Kronholm et al., 2012). What might cause an increase in insomnia is discussed, but the question is yet open to dispute. Increased stress levels due to changes in working life have been proposed as one explanation. In their study, Rowshan Ravan and colleagues (Rowshan Ravan et al., 2010) have concluded that middle-aged women before menopause seem to perceive more sleeping problems than earlier generations based on cohort comparisons. For women, dual roles with increased participation in working life as well as responsibilities at home have been proposed as one explanation. The previous studies have found no association between insomnia-related symptoms and alcohol consumption, leisure time physical activity or coffee drinking, for example. In the present data, the increase in insomnia was distributed evenly over different socio-economic groups, making it difficult to make assumptions based on socio-economic inequality. One assumption is that there might be some more general changes in society that have affected circadian rhythms and sleep patterns, and have also increased sleeping problems. However, more research is needed to clarify the issue.

Stress increased linearly over time in an even more pronounced manner than insomnia. Explanations for this trend remains similarly unclear, and no previous studies could be found that have explored over time prevalence of stress. Increase in stress was demonstrated throughout different socio-economic groups, thus not attributing to explanation based on educational, employment status or income level differences. The only groups that were not exposed to general increase in stress over time were retired (<65 years) women and students who demonstrated only separate peaks of stress over some study periods among both genders.

7.2.2 Socio-economic differences in psychological distress

In this study, different measures of *education* produced different types of associations with opsychological distress. The most contradictory finding was that lower educational qualification was associated with more insomnia and lower

education measured in years with less insomnia among men. This inconsistency is difficult to interpret, but higher education measured in years may include those that have for different reasons delayed and unfinished education, and it does not necessarily indicate high educational attainment and qualifications. In addition, information for educational qualification was based on register data whereas information for years of education was based on self-report.

There were pronounced reversed associations between educational measures and stress; the highest educated experienced more stress. This finding is congruent with many other previous studies, yet the phenomenon is not clearly explained in the literature (Maslach et al., 2001, Matthews and Gallo, 2011). One explanation, especially related to work stress, is that those with higher education may have gained an occupational status that includes greater responsibilities and higher expectations, and therefore higher stress levels (Schaufeli and Enzmann, 1998). Another explanation may be related to the complexity of the stress concept and measurement. Therefore, specific measures of stress would be required in order to examine different sources and exposures of stress, duration, and coping resources and responses. A couple of studies have analysed experiences of daily stressors or hassles in different educational groups with daily diary data (Almeida et al., 2005, Grzywacz et al., 2004). Those results revealed that although better educated individuals reported more daily stressors (measured as stress exposure, stress severity and symptoms), stressors reported by those with less education were more severe, and were appraised as posing a greater risk to their financial situation and to their self-concept. Additionally, when exposed to stressors, less educated adults reported more physical symptoms and more psychological distress compared to those with higher education. Adler and colleagues (Adler et al., 1994) found that given similar stressors, due to a lack of material and psychological coping resources those with lower SES are more likely to experience negative health consequences. In general, the stress measure in the present study is only exploring a perception of stress, with no specific information about sources, coping or outcomes. However, the analyses of the ‘my life is nearly unbearable’ category alone revealed that extremely high stress was more common in those with lower levels of education compared to the highest educated, although this was not independent of the other socio-economic factors. Therefore, there is evidence which supposedly indicates that even though stress seems to be more common among the highest educated, extremely stressful situations experienced among those with the lowest level of education may be associated with more vulnerability and more severe consequences. On the other hand, in recent reviews the mediating role of stress in connecting SES with health outcomes is questioned, due to inconsistent findings (Matthews et al., 2010). Only weak evidence has been found for the association between SES and neuroendocrine biomarkers of stress, such as cortisol level, or allostatic load (the concept of cumulative wear and tear on the

body caused by inefficient adaptation of psychological responses to stressors) (Dowd et al., 2009).

Employment status has been found in large-scale population studies to be one of the prime indicators associated with common mental disorders (Fryers et al., 2003). In the present study, *unemployed* respondents had consistently more psychological distress according to all the measures, being in line with prior documentation for the association of unemployment with psychological distress (Lahelma, 1989, Arber et al., 2009, Baum et al., 1999, Bjerkeset et al., 2008, Viinamäki et al., 1993). Employment is related to most of the environmental features that Warr (Warr et al., 1988) proposes are responsible for mental health, for example skill use, interpersonal contact, availability of money and valued social position. Unemployed and economically inactive groups have less access to those resources. On the other hand, poor mental health may also affect a person's work capacity and functioning and be prior causes of unemployment. In the prospective follow-up studies, poor general mental health (MHI-5) (Butterworth et al., 2011), stress (Leino-Arjas et al., 1999) and depressive symptoms (Whooley et al., 2002) have been found to predict subsequent unemployment.

Research has produced inconsistent findings related to the associations of *retirement* with mental health, showing both an improvement and an increase in symptoms. For example, sleep disturbances have been found to improve following retirement, which have been explained by the removal of work-related risk factor exposures. However, retirement on health grounds has been found to be associated with an increase in sleep disturbances following retirement (Vahtera et al., 2009). In the present study, retired respondents were early retirees (<65 years), comprising early old-age pensioners, part-time pensioners, disability pensioners and unemployment pensioners. Unfortunately, it was not possible to identify those respondents who were retired due to mental illness. However, there was compelling evidence in the present study that those who were early retirees experienced more psychological distress on all dimensions. Early retirement is known to be associated with lower mental and physical health (Buxton et al., 2005, Mein et al., 2000, Olesen et al.). Mental (especially depression) and musculoskeletal disorders predict and are the most common reasons for granting disability pension in Finland (Statistics Finland, 2010, Salminen et al., 1997, Karpansalo et al., 2005, Ahola et al., 2011). Furthermore, also sleep problems have been found to predict subsequent early retirement (Lallukka et al., 2011).

Those *with the lowest level of income* had more depression and stress among both genders. Previous research has found income to be a stronger predictor of depressive symptoms than education (Aluoja et al., 2004) and the present study demonstrated similar findings. Results presented in Ohayon's review (Ohayon, 2002) fail to identify lower income levels as an independent risk factor for insomnia symptomology. In the present study, insomnia and especially stress

produced a U-shaped distribution with income, suggesting intermediate levels being protective for stress and insomnia. This may indicate that those with intermediate income levels enjoy better social participation and material resources compared to those with the lowest income level but less access to those detrimental factors associated with higher social position and occupational status earlier discussed with education.

7.2.3 Family status differences in psychological distress

In this study, those *not having a partner*, including those who have been divorced, and widowed and those who have never married, showed higher psychological distress in all measures. Several previous studies have also presented that those who are married exhibit lower levels of psychological distress (Aromaa and Koskinen, 2004, Joutsenniemi et al., 2006, Aro et al., 2001, Meertens et al., 2003). According to Umberson and Williams (Umberson and Williams, 1999), theoretical explanations for the positive effects of partnership include better economic resources, social integration and an enhanced sense of meaning and purpose. Divorce and widowhood are both marital status transitions that have to do with the stresses and strains of marital dissolution and financial difficulties. Evidence of the effect of marital status transitions on mental health has shown, however, that an increase in psychological distress may not be permanent but it may attenuate over time (Booth and Amato, 1991).

Parental status is known to have both a negative and a positive effect on psychological distress, and several studies have shown gender differences in parenthood (Matthews et al., 2001, McDonough and Walters, 2001, Artazcoz et al., 2004). It has been assumed that parenting of minor children is associated with higher psychological distress, especially in women (Umberson and Williams, 1999). However, in this study living with children under 18 was associated with increased stress only among men, and less insomnia among women. Those not having any children may have poorer mental health, as parenthood is also proposed to be associated with better general health and sense of meaningfulness and purpose in life. In this data, those without children were not able to be separated from those who had adult children, so they are both included in the same category. However, the effect of this is obscure, as having adult children is proposed to have a positive impact on women's mental health in particular (Umberson and Williams, 1999). Moreover, the complex settings of parenting may involve both biological progeny and stepchildren, or none of one's own children living in the household.

7.2.4 Changes in the socio-economic differences in psychological distress over time

Some temporal changes were observed in insomnia and stress by employment status among both genders, as differences between unemployed and employed respondents narrowed during the period of high unemployment 1993–1997. A similar trend was observed for depression; however, this was not statistically significant. Narrowing differences, which were mainly owing to the decrease in psychological distress among the unemployed, may indicate that over the course of the general economic recession, unemployment is not as selective as usual and may affect people irrespective of their socio-economic background. Valkonen and colleagues (Valkonen et al., 2000) found that the economic recession slowed down rather than sped up the growth of relative inequalities in mental health-related mortality (such as alcohol-related causes, accidents and suicide) in Finland. However, a Swedish study (Rahmqvist and Carstensen, 1998) found an increase in the prevalence of psychological distress during the economic recession period between 1989–1995 in both employed and unemployed groups.

Meertens and colleagues (Meertens et al., 2003) found in a longitudinal follow-up study that income differences in depressive symptoms have increased over time. In the present cross-sectional study a change over time appeared by household income only in stress among men. A gap between the lowest level of household income and other levels of income emerged in stress levels during the latest study periods. General income inequalities are known to have grown since the period of recession in Finland (Palosuo et al., 2009).

In women, after the first study period with non-existing educational differences in stress, a steep increase in stress among the highest educated induced inverse associations. In women, the common trends since the first study period were pronounced growth in the proportion of the highest educated, and also an increase in those who were employed together with a decrease in the proportion of housewives, which reflect the general transitions experienced by women in society. An increasing number of women than before may have achieved higher social standings, which relate to those associations of highest education experiencing more stress, which was discussed in the previous chapter.

In general, based on the results of the present study, socio-economic differences in psychological distress did not change substantially from 1979 to 2002. However, it should be also emphasized that some of the gradients in insomnia and stress were reversed and curvilinear.

7.2.5 Psychological distress in explaining socio-economic differences in cause-specific mortality

Previous studies that have included factors such as depression and stress as possible mediators for SES and all-cause mortality connections have found some

support for their assumption. Studies have found depression and stress to attenuate the socio-economic differences in all-cause mortality for low versus high income (Khang and Kim, 2005, Lantz et al., 2005). In the study conducted by Fiscella and Franks (Fiscella and Franks, 1997), depression and hopelessness accounted for between 3 and 11% of the association between SES and all-cause mortality.

Few studies could be found that have examined the effect of psychological distress on socio-economic differences in suicide, accidents and violence, and alcohol-related mortality. Based on the present findings, depression, insomnia and extremely high stress explained 12–31% of the SES differences in suicide, accidents and violence, and alcohol-related, so called unnatural mortality. This could indicate poor resources and coping strategies of psychological distress in the lower socio-economic positions, which obviously include suicidal and risky behaviour and, above all, heavy alcohol consumption that may be aimed to alleviate psychological symptoms. Insomnia was not examined in any of the earlier studies; however, in this present study the contribution of insomnia on socio-economic inequality in unnatural mortality was comparable to depression and stress.

In addition, few studies have explored the effect of psychological distress on CHD mortality inequality. Lynch and colleagues (Lynch et al., 1996) found depression, hopelessness and cynical hostility to contribute to the association between SES and cardiovascular and all-cause mortality. In this present study, the contribution of depression, insomnia and stress to socio-economic differences in CHD mortality was minor or insignificant. Based on the same data, health behaviours have previously been examined as a possible explanation for educational level differences in CHD mortality (Laaksonen et al., 2008). In those results, health behaviours, most importantly smoking, physical activity and vegetable intake, explained about 50% of the educational differences in CHD mortality among men, and 14% among women. Corresponding evidence was found in another Finnish study; behavioural and biological risk factors, most importantly smoking, explained about a third of the excess CHD mortality differences by occupational status among men. In women, occupational differences in CHD mortality were not statistically significant (Harald et al., 2006). Compared to health behaviours, psychological factors examined in the present study contributed less to explaining socio-economic differences in CHD mortality. The role of other psychological factors, such as hostility and cynicism, hopelessness and anxiety, which have been also proposed to explain socio-economic differences in CHD mortality (Gallo and Matthews, 2003), were not explored in the present study.

In general, previous reviews have concluded that research examining the meditational effects of psychological factors for socio-economic status and health connections has provided inconclusive evidence for the model (Gallo and Matthews,

2003). In particular, the evidence for stress as a pathway is less supported (Matthews and Gallo, 2011). Scholars and theories proposing psychological factors as mediators in the SES-health relationship emphasize the complexity of the issue, as health behaviour, socio-demographic factors and early environmental, genetic, biomedical and medical factors are all seen as being related to this phenomenon.

7.3 Methodological considerations

The strength of this study is the use of nationally representative data from repeated cross-sectional population surveys, which was supplemented with reliable SES data from Statistics Finland, and the Finnish Cause of Death Register data. As trend analyses over time are rare, this study provided new information about self-reported depression, insomnia and stress by socio-economic factors over a 24-year time scale, as well as a prospective study design with a 28-year mortality follow-up. However, due to the cross-sectional setting, no conclusions can be made about the directions of the associations; that is, health selection versus causation, which may both contribute to the associations between socio-economic status and psychological factors (Gallo and Matthews, 1999).

One important limitation of the study that should be mentioned is that the data included mainly non-specific single-item measures of psychological distress. As has been stated earlier, the main purpose for these measures is to explore the subjective dimension of mental health, and they are feasible for the monitoring of subgroup differences at an extensive population level (Korkeila, 2000). They indicate subjective distress and deterioration of subjective mental health, which may or may not indicate mental disorder. In other words, these measures may cover a variety of transient or chronic psychological symptoms, from the temporary decrease of psychological well-being to severe mental disorders. Nevertheless, single-item depression, insomnia and stress demonstrated significant associations with CHD and unnatural mortality, indicating that these measures have notable implications for health. When compared to the validated and recommended measure for psychological distress (MHI-5) (Pez et al., 2006, Ware and Sherbourne, 1992, Berwick et al., 1991, Rumpf et al., 2001, Yamazaki et al., 2005), self-reported depression, insomnia and stress correlated well or moderately with this measure. In future population surveys, it would be important to include specific and validated measures of psychological distress.

One other limitation of the data to mention is that the overall response rate of the survey used has decreased over the years from over 80% to 65%. This is a common trend, as similar rates have been found in other population surveys (Asch et al., 1997). Several non-respondent analyses of this data revealed that the non-respondents were more likely to be male, young and less educated. In addition, gender and educational differences in the response rate have further widened over time (Tolonen et al., 2006, Tolonen et al., 2010). It was also shown that total and

cause-specific (for example, alcohol, external causes, suicide) excess mortality rates were higher among survey non-respondents, which was partly explained by educational and income differences between respondents and non-respondents (Tolonen et al., 2010). In non-response analyses in a health survey among 24-year-old Finnish males, non-response was higher among those who had suffered mental disorders, who were unemployed or were receiving a disability pension. Smoking in adolescence also predicted non-response (Pietilä et al., 1995). Alcohol use and mental distress predicted moderately non-response in the Norwegian population health study (Torvik et al., 2012). As an indication of non-response analyses, it can be assumed that non-respondents may have more severe illnesses, mental health problems and depression as well as unhealthy lifestyles, including smoking and alcohol use. Therefore, lower response rates in certain socio-economic groups may also bias some of the socio-economic differences in psychological distress observed in this study. Moreover, in the present study, respondents with missing data on psychological distress – in this case stress variable – were also more likely to be in the lower socio-economic groups.

Over the study period 1979–2002, major economic and societal changes took place in Finland. People are more highly educated than before, and more women work outside the home. The burden and role of work has changed, and it has become less physically but more psychologically demanding. The economic boom continued throughout the 1980s until the burst of the economic recession period at the beginning of the 1990s. That period caused unemployment and loss of income for a wide population. Economic growth followed the recession period and also started a new increase in income differentials, which had started to narrow in the 1970s. General societal changes may have had some effect on the prevalence of psychological distress or the association with socio-economic differences as have been discussed earlier. However, general economic growth and improvement in well-being did not seem to have any major influence on inequalities in psychological distress. More research is needed to examine, for example, whether there might be more general factors on a societal level which have resulted in observed increase in insomnia and stress symptoms.

Depression, insomnia and stress are known to be associated with each other with complex interrelations. In the present study, these measures of psychological distress had moderate correlations ($r \leq 0.40$). However, the cross-sectional study design of the data does not allow for any conclusions about the causality of the studied associations. There is well-known co-morbidity with depression and other psychological symptoms, especially with insomnia, which is also included in the diagnostic criteria for depression (Ohayon, 2002). The additional modelling in the present study controlled the possible effect of depression on the socio-economic difference in insomnia and in stress. This had no significant reduction on the associations with insomnia and SES. The most significant effect following

adjustment for depression was that the retired (<65 years) and unemployed respondents no longer had more stress. Therefore, some of the employment status differences in stress may be explained by depression. However, if stress and insomnia symptoms precede and are predictors of depression, as some of the evidence suggests (Manber and Chambers, 2009, Brunner and Marmot, 2006, Pigeon, 2010), then adding depression in the analyses may also cause over-adjustment in the models. In addition, insomnia and stress are commonly thought to relate to each other (Steptoe et al., 2008) and work stress in particular is linked to insomnia (Åkerstedt et al., 2002, Kalimo et al., 2000, Åkerstedt, 2006). In the present data, 39% of those experiencing stress reported insomnia, and 41% of those who reported insomnia also reported stress. However, trends in the prevalence of depression, insomnia and stress were not identical to each other. Even though psychological symptoms are known to be related to each other and other indicators of mental health, they may also produce an independent risk factor for health and well-being.

The final methodological consideration concerns the register data linkage; until the 1987 survey, register linkage for education and income was conducted to the closest survey year due to the fact that register data was only available every five years, i.e. 1980 and 1985. The 1980 register data was linked to the survey years 1979–1983, and the 1985 statistics to the survey years 1984–1986. For the survey years 2001–2002, the 2000 register data was used. This may have caused some inaccuracies, especially if prior to or after the survey the respondents experienced major changes in their employment status or educational qualification, which also may have affected their income.

8 Conclusions

Simple psychological distress measures, such as in the present study, can yield new information about the subjective psychological distress of the population and its subgroups. Self-reported depression, insomnia and stress are distributed by socio-economic and social characteristics. High risk groups for depression, insomnia, stress and poor general mental health are the unemployed, early retired respondents and those with no partner. Moreover, those in the lowest income groups are at risk of depression and stress. However, some of the socio-economic gradients in stress and insomnia were curvilinear, and reversed depending on the measures and classifications used. Most notably, stress was most common among the highest educated, whereas lower educated had more extremely high stress. More studies are needed to examine the role of stress associated with different dimensions of socio-economic status, and also how different manifestations of stress contribute to socio-economic differences in health and mortality. In addition, more follow-up studies are needed to generate inferences for causal relationships.

Insomnia and stress have become more prevalent over the years. However, depression has become less prevalent among women. Increasing symptoms present a perceptible public health challenge. Future studies are needed to follow up and explain the observed increase in insomnia and stress symptoms which could not be explained by socio-economic factors in the present study.

Although socio-economic differences in psychological distress fluctuated slightly over the total period 1979–2002, significant changes in socio-economic differences were rare. In the future, public health objectives should target the reduction of socio-economic differences in psychological distress. However, reversed and curvilinear gradients should be borne in mind.

Depression, insomnia and extremely high stress partly accounted for socio-economic differences in unnatural mortality, and less for CHD mortality. Therefore, improvement of psychological symptoms in lower socio-economic groups may reduce some of the socio-economic disparities, especially in suicide, accidents and violence, and alcohol-related mortality.

Social and socio-economic factors should be taken into account when monitoring mental health risk factors, and also for the evaluation of needs for interventions and policy-making among populations. In particular, the possible mental health problems of the unemployed, the early retired and those in the lowest income groups should be taken into account. The role of stress should be considered in detail. Early interventions directed at minor psychological distress may reduce subjective suffering and hence the incidence of more severe mental symptoms and chronic disorders.

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